



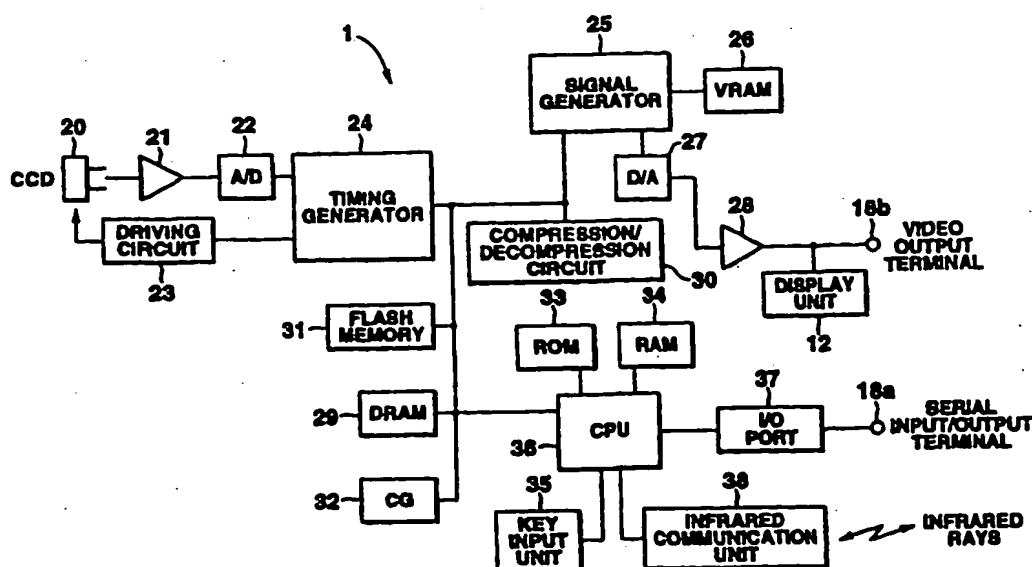
PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04N 1/21		A1	(11) International Publication Number: WO 99/12341
			(43) International Publication Date: 11 March 1999 (11.03.99)
(21) International Application Number: PCT/JP98/03851 (22) International Filing Date: 28 August 1998 (28.08.98) (30) Priority Data: 9/238440 3 September 1997 (03.09.97) JP (71) Applicant (for all designated States except US): CASIO COMPUTER CO., LTD. [JP/JP]; 6-2, Hon-machi 1-chome, Shibuya-ku, Tokyo 151-8543 (JP). (72) Inventors; and (75) Inventors/Applicants (for US only): AKASAWA, Mitsuyuki [JP/JP]; 3-51-34-202, Sumiyoshicho, Fuchu-shi, Tokyo 183-0034 (JP). MIYASAKA, Junichi [JP/JP]; 701-3-102, Katakuramachi, Hachioji-shi, Tokyo 192-0914 (JP). (74) Agents: SUZUYE, Takehiko et al.; Suzuye & Suzuye, 7-2, Kasumigaseki 3-chome, Chiyoda-ku, Tokyo 100-0013 (JP).			(81) Designated States: KR, US, European patent (DE, FR, GB, IT, NL). Published With international search report.

(54) Title: ELECTRONIC STILL CAMERA HAVING PHOTOGRAPHED IMAGE REPRODUCING FUNCTION



(57) Abstract

In a digital camera (1), when a "+" key (17a) or a "-" key (17b) is depressed to select reproduction/display of a panorama image after the reproduction mode is designated, the CPU (36) reads out the selected panorama image data from a flash memory (31), and stores it in a VRAM (26). When the "+" key (17a) or the "-" key (17b) is depressed after the first 1-frame image data of the panorama image data stored in the VRAM (26) is reproduced/displayed on the display screen of the display unit (12), the CPU (36) starts scrolling the displayed image on the display screen of the display unit (12).

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Larvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakistan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

DESCRIPTION

ELECTRONIC STILL CAMERA HAVING
PHOTOGRAPHED IMAGE REPRODUCING FUNCTION

5

Technical Field

The present invention relates to an electronic still camera and image reproducing method. The present invention can be suitably applied to a digital camera having a panorama image photographing function, in particular. However, the present invention is not limited to this.

Background Art

Digital cameras (electronic still cameras) designed to electronically store photographed images instead of recording them on films have recently become popular. In such a digital camera, when the photographer presses the shutter, an image of an object to be photographed which is received through the photographing lens is sensed by an image sensing element such as a CCD (Charge Coupled Device). The resultant data is subjected to data compression and the like and stored as image data in an internal memory.

Some digital cameras have panorama photographing functions of photographing landscape or portrait object images (panorama images) at angles wider than normal angle.

Assume that a picture is taken by using a panorama

photographing function of the type that generates a
panorama image by synthesizing a plurality of consecu-
tively photographed images. In this case, when the
plurality of images constituting the panorama image are
5 reproduced/displayed one by one by the same method as
that for the images photographed in the normal
photographing mode, the respective images constituting
the panorama image are separately displayed. That is,
the panorama photographing function cannot be
10 satisfactorily used.

Assume that a picture is taken by using a panorama
photographing function of the above type or a panorama
photographing function of the type that generates
a panorama image by cutting the upper and lower or left
15 and right portions of a photographed image at a prede-
termined ratio. In this case, if the panorama image
is displayed at once, the upper and lower or left and
right portions of the display unit inevitably become
non-display portions. As a result, the panorama image
20 is displayed in a considerably small size. In this
case, the panorama photographing function cannot be
satisfactorily used either.

Disclosure of Invention

The present invention has been made in
25 consideration of these problems, and has as its object
to provide an electronic still camera and an image
reproducing method which can cause an image display

unit to effectively display a photographed image having
an aspect ratio different from that of the image
display unit.

In order to achieve the above object, according
5 to a preferred aspect, an electronic still camera
comprises photographing means for acquiring image data
having an aspect ratio different from that of an image
display unit, and display control means for displaying
the image data acquired by the photographing means on
10 the image display unit. The display control means
further comprises scrolling control means for, when the
image data acquired by the photographing means is to be
displayed on the image display unit, causing the image
display unit to display partial image data of the image
15 data, and also causing the image display unit to scroll
the image data by consecutively changing/controlling
the partial image data to be displayed by the image
display unit. With this arrangement, the image display
unit can effectively display an image having an aspect
20 ratio different from that of the image display unit by
optimally and effectively using the image display unit.

Brief Description of Drawings

FIG. 1 is a perspective view showing the outer
appearance of a digital camera 1 to which the present
25 invention is applied;

FIG. 2 is a block diagram showing the circuit
arrangement of the digital camera 1 in FIG. 1;

FIG. 3 is a view showing the memory configuration of a flash memory 31 in FIG. 2;

FIG. 4 is a view showing the memory configuration of a RAM 34 in FIG. 2;

5 FIG. 5 is a flow chart showing the image sensing condition setting processing executed by the CPU 36 in FIG. 2;

10 FIGS. 6A and 6B are views showing display samples on the screen in the image sensing condition setting processing in FIG. 5;

FIG. 7 is a flow chart showing the panorama image sensing processing executed by the CPU 36 in FIG. 2;

15 FIGS. 8A and 8B are views (first views) for explaining display control on a display unit 12 serving as a finder in the panorama image sensing processing in FIG. 7;

20 FIGS. 9A, 9B, 9C, and 9D are views (second views) for explaining display control on the display unit 12 serving as a finder in the panorama image sensing processing in FIG. 7;

25 FIGS. 10A, 10B, and 10C are views showing how a reproduced image display area 12b and a through screen area 12c are set on the display unit 12 (finder) in photographing for the second or subsequent image data in the panorama photographing mode when the photographing direction of a panorama image is set to the horizontal direction from the right to left, the

vertical direction from the bottom to top, and the vertical direction from the top to bottom in the image sensing condition setting processing in FIG. 5;

FIGS. 11A and 11B are views showing a modification of the set state of reproduced image display areas 12b1 through 12b4 and the through screen area 12c on the display unit 12 (finder) in photographing for the second or subsequent image data in the panorama photographing mode;

FIG. 12 is a flow chart showing the reproduction display processing executed by the CPU 36 in FIG. 2;

FIG. 13 is a view showing a modification of step S41 in the flow chart for the reproduction display processing in FIG. 12;

FIG. 14 is a flow chart showing step S43 in the flow chart for the reproduction display processing in FIG. 12 in detail;

FIG. 15 is a view showing modification 1 (first view) of the detailed flow chart in FIG. 14;

FIG. 16 is a view showing modification 1 (second view) of the detailed flow chart in FIG. 14;

FIG. 17 is a view showing modification 2 of the detailed flow chart in FIG. 14;

FIG. 18 is a view showing a modification of the flow chart for the reproduction display processing in FIG. 12;

FIG. 19 is a view showing a modification of step

SD13 in the modification of the flow chart for the reproduction display processing in FIG. 18;

FIGS. 20A, 20B, 20C, and 20D are views showing the panorama image synthesized by the reproduction display processing in FIGS. 12 through 19 and reproduced/displayed by the display unit 12;

FIG. 21 is a flow chart (first flow chart) showing the communication processing executed by the CPU 36 in FIG. 2;

FIG. 22 is a flow chart (second flow chart) showing the communication processing executed by the CPU 36 in FIG. 2; and

FIGS. 23A, 23B, 23C, and 23D are views showing data communication between the digital camera 1 in FIG. 1 and an external device.

Best Mode of Carrying Out the Invention

A preferred embodiment of the present invention will be described in detail below with reference to the accompanying drawings.

Note that in the following embodiment, panorama images include a portrait image obtained by photographing an object at an angle wider than normal angle as well as a landscape image obtained by photographing an object at an angle wider than normal angle.

The configuration will be described first.

FIG. 1 is a perspective view showing the outer appearance of a digital camera 1 (electronic still

camera) to which the present invention is applied.

Referring to FIG. 1, an image sensing lens 11 (dashed line) is placed on the rear surface side of a body casing 1a. A display unit 12 composed of a liquid crystal display (LCD) and the like is placed on the

front surface side of the body casing 1a in FIG. 1. In photographing operation, an object image received through the image sensing lens 11 can be displayed on the display unit 12 serving as a finder. In addition, after photographing operation, the sensed image can be reproduced and displayed on the display unit 12.

A mode switch 13 is placed on the right side of the display unit 12. The mode switch 13 is slid vertically to designate switching of photographing modes (normal photographing mode and panorama photographing mode), a reproduction mode, and a communication mode.

A power switch 14, a shutter key 15, an effect key 16, and "+" and "-" keys 17a and 17b are placed on the upper surface side of the body casing 1a in FIG. 1.

The power switch 14 is slid horizontally to designate power ON/OFF switching. The shutter key 15 is used to designate image sensing and determination of contents selected in the respective modes. The effect key 16 is used to designate the cancellation of contents selected in the respective modes. The "+" and "-" keys 17a and 17b are used to select/designate image data to be reproduced/displayed on the display unit 12 from

a plurality of image data stored in a memory (flash memory 31 to be described later) and select conditions to be set in the respective modes.

5 A serial input/output terminal 18a and a video output terminal 18b are placed on the upper surface side of the body casing 1a in FIG. 1. The serial input/output terminal 18a is used to transmit/receive image data, control data, and the like to/from an external device through a communication cable (not
10 shown). The video output terminal 18b is used to output, to an external device, a video signal identical to a video signal (display data) to the display unit 12. A communication cable such as an RS-232C (serial) cable can be connected to the serial input/output terminal
15 18a. An infrared communication window 19 (dashed line) through which image data, control data, and the like are transmitted/received to/from an external device by infrared signals is formed on the rear surface side of the body casing 1a in FIG. 1.

20 The digital camera 1 may be composed of a camera portion including the image sensing lens 11 and a main body portion. The camera portion may be rotatably and detachably mounted on the main body portion to allow the image sensing lens 11 to variously rotate and move
25 with respect to the main body.

FIG. 2 is a block diagram showing the circuit arrangement of the digital camera 1 in FIG. 1.

Referring to FIG. 2, the digital camera 1 comprises the display unit 12 in FIG. 1, a CCD 20, an amplifier 21, an A/D converter 22, a driving circuit 23, a timing generator 24, a signal generator 25, a VRAM 26, a D/A converter 27, an amplifier 28, a DRAM 29, a compression/decompression circuit 30, the flash memory 31, a CG 32, a ROM 33, a RAM 34, a key input unit 35, a CPU 36, an I/O port 37, and an infrared communication unit 38.

The CCD (Charge Coupled Device) 20 is composed of a pixel surface on which many elements (pixels), each formed by stacking a transfer electrode on a light-receiving portion such as a photodiode, are arranged two-dimensionally, and an output portion for converting the charge stored in each pixel into a voltage and outputting it. Light coming through the image sensing lens 11 is received by the pixel surface, and a charge proportional to the amount of light received is stored in each pixel. The charges stored in the respective pixels are sequentially read out as an image sensing signal (analog signal) from the output portion in units of pixels in accordance with a driving signal supplied from the driving circuit 23. The signal is then output to the A/D converter 22 through the amplifier 21.

The A/D (Analog to Digital) converter 22 converts the image sensing signal, input from the CCD 20 through the amplifier 21, from an analog signal to a digital

signal, and supplies it to the timing generator 24.

The driving circuit 23 controls the exposure and read timings of the CCD 20 on the basis of the timing signal supplied from the timing generator 24.

5 The timing generator 24 generates a timing signal for controlling the driving circuit 23 on the basis of a video capture signal input from the CPU 36.

The signal generator 25 performs color computation processing for the image sensing signal (digital
10 signal) supplied through the timing generator 24 to generate image data made up of a luminance signal (Y data) and a color signal (C data), and outputs the image data to the DRAM 29.

The signal generator 25 generates a video signal
15 (digital signal) by, for example, adding a sync signal to the image data supplied from the DRAM 29 by the CPU 36, and temporarily stores it in the VRAM 26. Thereafter, the video signal stored in the VRAM 26 is output to the display unit 12 through the D/A converter
20 27 and the amplifier 28. If an external device is connected to the video output terminal 18b through a video cable, this video signal is also output to the external device.

In this signal generator 25, display control
25 processing similar to that for the above normal image data is also performed for panorama image data generated by synthesizing a plurality of sensed image

data in reproduction display processing (see FIGS. 12 through 19) and communication processing (see FIGS. 21 and 22) to be described later. That is, the signal generator 25 generates a video signal (digital signal) by, for example, adding a sync signal to the panorama image data supplied from the DRAM 29 by the CPU 36, and stores it in the VRAM 26. The signal generator 25 then reads out a 1-frame video signal from the VRAM 26, and outputs the signal to the display unit 12 through the D/A converter 27 and the amplifier 28.

The VRAM (Video Random Access Memory) 26 is a video memory for temporarily storing the video signal (display data) generated by the signal generator 25, and has a memory capacity enough to store the above panorama image data.

The D/A (Digital to Analog) converter 27 converts the video signal (display data), supplied from the VRAM 26 by the signal generator 25, from a digital signal to an analog signal, and outputs it to the display unit 12 through the amplifier 28. If an external device is connected to the video output terminal 18b through the video cable, the D/A converter 27 also outputs this signal to the external device.

The display unit 12 is composed of a liquid crystal display and the like and serves to display an image on the display screen on the basis of the video signal (display data) input through the D/A converter

27 and the amplifier 28. In photographing operation, an object image received through the image sensing lens 11 can be displayed on the display unit 12 serving as a finder. In addition, after photographing operation, 5 the sensed image data stored in the flash memory 31 can be reproduced and displayed on the display unit 12.

Note that the display screen and image display area of the display unit 12 need not coincide with each other. For example, the display screen may be composed of an image display area and a function display area. In addition, a reproduced image display area 12b and a through screen area 12c (see FIG. 8B) are set on the display unit 12. When a plurality of image data for a panorama image are to be obtained by photographing operation in panorama image sensing processing (see FIG. 7), the reproduced image display area 12b is used to reproduce/display an image of an end portion of the sensed image that is obtained immediately before the 20 second or subsequent image data is to be obtained by photographing operation. The through screen area 12c is used as a finder to display an image of the object to be photographed.

The DRAM (Dynamic Random Access Memory) 29 is a semiconductor memory for temporarily storing the sensed 25 image data supplied from the signal generator 25 or the image data read out from the flash memory 31 by the CPU 36 and decompressed by the compression/decompression

circuit 30. The DRAM 29 is also used as a work area for synthesizing panorama image data on the basis of a plurality of sensed image data in reproduction display processing (see FIGS. 12 through 19) and communication processing (see FIGS. 21 and 22).

The compression/decompression circuit 30 compresses the image data stored in the DRAM 29 by encoding. More specifically, the compression/decompression circuit 30 compresses (encodes) the image data by a predetermined encoding scheme, i.e., a scheme corresponding to the type of image processed (still image in this case), e.g., DCT (Discrete Cosine Transform) in units of 8×8 pixels in accordance with the JPEG (Joint Photographic Experts Groups) algorithm, quantization, and Huffman encoding and outputs the compressed image data to the flash memory 31. The compression/decompression circuit 30 decodes and decompresses the compressed image data stored in the flash memory 31, and outputs it to the DRAM 29.

The compression/decompression circuit 30 also compresses panoramic image data by the above encoding scheme when the panorama image data is to be transferred to an external device in communication processing to be described later (see FIGS. 21 and 22).

The flash memory 31 is a semiconductor memory for storing a plurality of image data compressed by the compression/decompression circuit 30.

FIG. 3 shows the memory configuration of the flash memory 31. As shown in FIG. 3, the flash memory 31 stores image data in correspondence with page No. data, panorama flag data, and synthesis condition data.

5 The page No. data is numerical data indicating serial numbers assigned to the image data in the order in which they are stored in the flash memory 31. For example, page No. data "1" is assigned to the image data stored first in the flash memory 31, and page
10 No. data "2" is assigned to the image data stored next.

As the panorama flag data, "1" is stored if the corresponding image data is one of a plurality of image data sensed for a panorama image. Otherwise, i.e., if the corresponding image data is normal sensed image
15 data, "0" is stored.

The synthesis condition data is data to be stored if the panorama flag data is "1". This data describes synthesis conditions under which a plurality of image data sensed for a panorama image are synthesized into
20 panorama image data in reproduction display processing (see FIGS. 12 through 19) and communication processing (see FIGS. 21 and 22) to be described later.

This synthesis condition data is made up of joint picture count data, photographing direction data, and
25 image sensing order data, and is written in a data format like "3R-1".

The joint picture count data is the first-digit

numerical data in the data format of the synthesis condition data. This data indicates the number of sensed images forming this panorama image.

The photographing direction data is the second-digit data of the data format. This data indicates the photographing direction of a plurality of image data which are independently obtained by consecutively photographing an object at a wide angle in a predetermined direction in the panorama photographing mode.

This photographing direction data is set in photograph condition setting processing to be described later (see FIG. 5). When the respective image data are consecutively sensed from the left to right in the horizontal direction, "R" (Right) is set. When the respective image data are consecutively sensed from the right to left in the horizontal direction, "L" (Left) is set. When the respective image data are consecutively sensed upward in the vertical direction, "U" (Up) is set. When the respective image data are consecutively sensed downward in the vertical direction, "D" (Down) is set.

The image sensing order data is the fourth-digit numerical data following "-" (hyphen) of the above data format. This data indicates the image sensing order of the respective image data sensed for a panorama image.

The data format example "3R-1" of the synthesis condition data therefore indicates that this panorama image is composed of three sensed images, the three

sensed images are consecutively sensed from the left to right in the horizontal direction, and the sensed image corresponding to this synthesis condition data is the first image that was sensed.

5 The CG (Character Generator) 32 is a memory for storing character data to be displayed on the display unit 12, e.g., kana data, kanji data, alphanumeric data, and symbol data for operation guidance.

10 The ROM (Read Only Memory) 33 is used to store various control programs for controlling the respective portions of the digital camera 1, which are executed by the CPU 36, in image sensing condition setting processing (see FIG. 5), panorama image sensing processing (see FIG. 7), reproduction display processing (see FIGS. 12 through 19), communication processing (FIGS. 21 and 22), and the like which will be described later. These control programs are stored as program codes that can be read by the CPU 36.

15 The RAM (Random Access Memory) 34 is made up of a work memory 34a in which programs for controlling various types of control processes are mapped when they are executed by the CPU 36 or various data to be processed are temporarily stored, and an image sensing condition memory 34b for storing various image sensing condition data (e.g., shutter speed, aperture, and the photographing direction of a panorama image) set by image sensing condition setting processing (see FIG. 5)

to be described later.

The image sensing condition memory 34b is a nonvolatile memory such as an EEPROM (Electrical Erasable Programmable ROM), and hence can retain the stored contents after the power is turned off.

The key input unit 35 is made up of the mode switch 13, the power switch 14, the shutter key 15, the effect key 16, and the "+" and "-" keys 17a and 17b. The key input unit 35 outputs various operation signals corresponding to the pressing and sliding operations of the respective keys to the CPU 36.

The CPU (Central Processing Unit) 36 is a central processing unit for controlling the respective portions of the digital camera 1 in accordance with the various control programs stored in the ROM 33. More specifically, when the mode switch 13 is slid to designate the panorama photographing mode, the CPU 36 executes panorama image sensing processing (see FIG. 7) to be described later.

In this panorama image sensing processing, when the second and subsequent image data are to be sensed, the CPU 36 sets the reproduced image display area 12b for reproducing/displaying a portion of the previously sensed image data in the display unit 12 serving as a finder, and reproduces/displays a portion of the previously sensed image data, stored in the flash memory 31, in the reproduced image display area 12b.

In addition, the CPU 36 sets the remaining area of the display unit 12 as the through screen area 12c, and displays an image of the sensed object in the through screen area 12c.

5 In this case, the CPU 36 controls the position of the reproduced image display area 12b to be set in the display unit 12 on the basis of the photographing direction set in image sensing condition setting processing (see FIG. 5) to be described later. The CPU
10 36 also controls the image area of the previously sensed image data to be reproduced/displayed in the reproduced image display area 12b on the basis of the set photographing direction.

 The CPU 36 executes image sensing processing upon
15 depression of the shutter key 15, and outputs a video capture signal to the timing generator 24. The timing generator 24 generates a timing signal and outputs it to the driving circuit 23 on the basis of the video capture signal. The driving circuit 23 controls the
20 exposure and read timings of the CCD 20 on the basis of the timing signal. The A/D converter 22 converts the received image sensing signal from an analog signal to a digital signal. The signal generator 25 performs
25 color computation processing for the image sensing signal to generate image data, and stores it in the DRAM 29. The CPU 36 transfers the image data stored in the DRAM 29 to the compression/decompression circuit 30

to make the circuit compress the data. The CPU 36 then stores this compressed image data in the flash memory 31 in correspondence with new page No. data, new panorama flag data (= 1), and new synthesis condition data.

The CPU 36 also executes reproduction display processing (see FIGS. 12 and 18) to be described later when the reproduction mode is designated upon sliding operation of the mode switch 13.

In this reproduction display processing, the CPU 36 designates image data to be reproduced/displayed from the image data stored in the flash memory 31 in the page No. order in accordance with depression of the "+" key 17a or the "-" key 17b (in ascending order when the "+" key 17a is depressed; in descending order when the "-" key 17b is depressed). The CPU 36 checks whether the designated image data are image data sensed in the panorama photographing mode. If they are image data sensed in the panorama photographing mode (panorama flag data = 1), the CPU 36 sequentially reads out this image data and the respective image data consecutively sensed in the panorama photographing mode from the flash memory 31, and transfers the image data to the compression/decompression circuit 30 to make it decompress the data. The CPU 36 then stores the data in the DRAM 29.

The CPU 36 synthesizes the image data stored in

the DRAM 29 on the basis of the synthesis condition data to generate panorama image data of a wide-angle image of the object, and transfers the panorama image data to the signal generator 25. The signal generator 5 25 generates a video signal (display data) by, for example, adding a sync signal to the input panorama image data, and temporarily stores the data in the VRAM 26. The signal generator 25 then reads out 1-frame image data from the VRAM 26 and outputs the data to the 10 display unit 12 through the D/A converter 27 and the amplifier 28, thereby reproducing/displaying a portion of the panorama image on the display screen.

When this panorama image is reproduced/displayed, the CPU 36 displays, on the display screen, a panorama 15 image mark 12d "P" indicating that the displayed image is a panorama image. In addition, the CPU 36 sends a scrolling direction signal to the signal generator 25 in accordance with depression of the "+" key 17a or the "-" key 17b. The signal generator 25 continuously 20 changes/controls the 1-frame image data read out from the VRAM 26 in accordance with this scrolling direction control signal so as to scroll the panorama image on the display unit 12 in accordance with depression of the "+" key 17a or the "-" key 17b.

25 When the mode switch 13 is slid to designate the communication mode, the CPU 36 executes communication processing (see FIGS. 14 and 15) to be described later.

In this communication processing, the CPU 36 reproduces/displays the image data (normal sensed image data or panorama image data) stored in the flash memory 31 on the display unit 12 in accordance with depression of the "+" key 17a or the "-" key 17b in the same manner as in the above reproduction display processing. Upon depression of the shutter key 15, the CPU 36 designates the image data currently reproduced/ displayed on the display unit 12 as image data to be transferred to an external device, and transfers the image data (normal sensed image data or panorama image data obtained by image synthesis) mapped in the DRAM 29 for reproduction/display to the compression/decompression circuit 30. Upon making the compression/decompression circuit 30 compress the data, the CPU 36 outputs the image data to the infrared communication unit 38. The CPU 36 then transfers the image data from the infrared communication unit 38 to the external device as a destination by using infrared pulses.

The I/O (Input/Output) port 37 is an interface for performing input/output control on serial data (image data, control data, and the like) to be exchanged between the digital camera 1 and the external device connected thereto through the serial input/output terminal 18a and a communication cable.

The infrared communication unit 38 is an infrared

interface for performing infrared communication based on the IrDA (Infrared Data Association) scheme between the digital camera 1 and the external device, and performs transmission/reception control on image data, control data, and the like to be exchanged by infrared communication.

More specifically, the infrared communication unit 38 is constituted by a transmission data memory for temporarily storing transmission data to be transmitted to an external device having an infrared communication function, a modulating section for modulating the data stored in the transmission data memory into an infrared signal, a transmission LED for transmitting the modulated Ir signal to the external device through the infrared communication window 19 by using infrared pulses, a photodiode for receiving, through the infrared communication window 19, the infrared signal transmitted from the external device by using infrared pulses, a demodulating section for demodulating the received infrared signal into reception data, and a reception data memory for temporarily storing the demodulated reception data.

The digital camera 1 has the above arrangement.

Its operation will be described next.

Image sensing condition setting processing executed by the CPU 36 of the digital camera 1 will be described first with reference to the flow chart of

FIG. 5 and the display samples shown in FIGS. 6A and 6B.

When the mode switch 13 is slid to designate the reproduction mode, and the effect key 16 is depressed, the CPU 36 displays a menu describing various processes (e.g., zooming processing, color correction processing, and image sensing condition setting processing) on the display unit 12, as shown in FIG. 6A. When image sensing condition setting processing of these processes is selected/designated, the CPU 36 reads out the program associated with the image sensing condition setting processing from the ROM 33, and starts the processing.

First of all, the CPU 36 performs initialization processing such as initialization (step S1) first, and then checks on the basis of key operation whether the image sensing condition setting processing for a panorama image is to be performed (step S2).

Upon determining that the image sensing condition setting processing for a panorama is not to be performed, the CPU 36 determines that another type of image sensing condition setting processing is to be performed. For example, the CPU 36 performs image sensing condition setting processing such as changing/setting the shutter speed to adjust the exposure time of the CCD 20 or changing/setting the aperture to adjust the amount of light received through the image sensing lens 11 so as to adjust the brightness of

the sensed image (step S3). The set image sensing condition data is stored in the image sensing condition memory 34b of the RAM 34 (step S4), and the image sensing condition setting processing is terminated.

5 If the CPU 36 determines in step S2 that the image sensing condition setting processing for a panorama image is to be performed, the CPU 36 displays, on the display unit 12, a setting window for setting the photographing direction of a panorama image, as shown
10 in FIG. 6B (step S5).

Referring to FIG. 6B, "HORIZONTAL" is a condition for sensing a plurality of images from the left to right in the horizontal direction in the panorama photographing mode, and "VERTICAL" is a condition for
15 sensing a plurality of images downward in the vertical direction in the panorama photographing mode.

The CPU 36 checks whether the photographing direction of a panorama image is selected/designated upon depression of the "+" key 17a, the "-" key 17b,
20 the shutter key 15, and the like (step S6). If the photographing direction of the panorama image is not selected/designated, the flow returns to step S5.

When the CPU 36 determines that the photographing direction of the panorama image is selected/designated,
25 the CPU 36 stores the data of the selected/designated photographing direction as image sensing condition data in the image sensing condition memory 34b of the RAM

34 (step S7). This image sensing condition setting processing is then terminated.

5 The above description concerns the sequence of image sensing condition setting processing executed by the CPU 36 of the digital camera 1.

10 In the above image sensing condition setting processing, control allows either the horizontal direction from the left to right ("HORIZONTAL") or the vertical direction from the top to bottom ("VERTICAL") to be set as a photographing direction in panorama image photographing operation. Obviously, however, control may allow the horizontal direction from the right to left and the vertical direction from the bottom to top to be also set.

15 The panorama image sensing processing executed by the CPU 36 of the digital camera 1 will be described next with reference to the flow chart of FIG. 7 and the display samples shown in FIGS. 8A and 8B and FIGS. 9A through 9D. In this panorama image sensing processing, a plurality of image data for a panorama image are sensed and stored.

20 For the sake of convenience, assume that in the following panorama image sensing processing, the horizontal direction from the left to right ("HORIZONTAL") is set as the photographing direction of the panorama image by the above image sensing condition setting processing, and a plurality of image data for

the panorama image are consecutively sensed in the horizontal direction from the left to right.

When the mode switch 13 is slid to designate the panorama photographing mode, the CPU 36 reads out the program associated with the panorama image sensing
5 processing from the ROM 33, and starts the processing.

First of all, the CPU 36 reads out the image sensing condition data stored in the image sensing condition memory 34b of the RAM 34 by the above image
10 sensing condition setting processing, and sets image sensing conditions such as shutter speed, aperture, and the photographing direction of the panorama image on the basis of the image sensing condition data (step S11).

15 The CPU 36 performs display control on the display unit 12 as a finder. When the first image is photographed, the CPU 36 sets the entire area of the display screen as a through screen 12a, as shown in FIG. 8A, and displays the object image received through
20 the image sensing lens 11 on the through screen 12a (step S12).

The CPU 36 checks whether the shutter key 15 is depressed (step S13). If the shutter key 15 is not depressed, the CPU 36 keeps checking whether the
25 shutter key 15 is depressed. If the CPU 36 determines that the shutter key 15 is depressed, the CPU 36 executes image sensing processing for the first image

(step S14).

The CPU 36 outputs a video capture signal to the timing generator 24. The timing generator 24 generates a timing signal and outputs it to the driving circuit 23 on the basis of the video capture signal. The driving circuit 23 controls the exposure and read timings of the CCD 20 on the basis of the timing signal to make the CCD 20 receive the image sensing signal. The A/D converter 22 converts the received image sensing signal from an analog signal to a digital signal. The signal generator 25 performs color computation processing for the image sensing operation to generate the first sensed image data, and stores it in the DRAM 29.

Subsequently, the CPU 36 transfers the sensed image data, stored in the DRAM 29, to the compression/decompression circuit 30, and make it compress the data (step S15). The CPU 36 then stores the compressed image data in the flash memory 31 in correspondence with new page No. data and the panorama flag data "1" (step S16).

The CPU 36 starts image sensing processing for the second and subsequent image data. First of all, the CPU 36 performs display control on the display unit 12 serving as a finder. In photographing the second and subsequent images, the CPU 36 sets the strip reproduced image display area 12b on the left end portion of the

display screen, and also sets the remaining screen area as the through screen area 12c, as shown in FIG. 8B (step S17).

5 The CPU 36 reproduces/displays an image of the right end portion of the sensed image immediately preceding the current sensed image in the reproduced image display area 12b, and also displays the object image received through the image sensing lens 11 in the through screen area 12c (step S18).

10 Display control on the display unit 12 in steps S17 and S18 will be described in detail with reference to FIGS. 9A through 9C.

15 FIG. 9A shows the first sensed image data, which is sensed and stored in the flash memory 31 by the processing in steps S11 through S16. In photographing the second image, the CPU 36 sets the reproduced image display area 12b and the through screen area 12c on the display screen, as shown in FIG. 8B (step S17). In this case, first of all, the CPU 36 reads out the first
20 sensed image data from the flash memory 31 and maps it in the DRAM 29, and acquires an image of the right end portion of the sensed image data (corresponding to the area size of the reproduced image display area 12b), as shown in FIG. 9B.

25 As shown in FIG. 9C, the CPU 36 reproduces/displays the acquired image in the reproduced image display area 12b on the display screen, and also

displays the object image received through the image sensing lens 11 in the through screen area 12c (hatched portion) (step S18).

With this display control for the finder, when the second or subsequent image data is to be obtained by photographing in the panorama photographing mode, the user can sense the object image displayed in the through screen area 12c with its image position being matched with the end portion image of the sensed image immediately preceding the object image and reproduced/ displayed in the reproduced image display area 12b of the display unit 12 (finder) (see FIG. 9D). Therefore, a plurality of image data to be sensed for a panorama image can be sensed very easily while any shifts between the image data are minimized.

Subsequently, the CPU 36 checks whether the shutter key 15 is depressed (step S19). If the shutter key 15 is not depressed, the CPU 36 keeps checking whether the shutter key 15 is depressed. If the CPU 36 determines that the shutter key 15 is depressed, the CPU 36 executes image sensing processing for the second and subsequent images (step S20).

The CPU 36 generates the second or subsequent sensed image data in the same manner as in step S14 described above, and stores it in the DRAM 29. The CPU 36 transfers this sensed image data to the compression/decompression circuit 30 and makes it compress the

data (step S21). Thereafter, the CPU 36 stores this compressed image data in the flash memory 31 in correspondence with page No. data next to the page No. data assigned to the first sensed image data and
5 the panorama flag data "1" (step S22).

The CPU 36 then checks whether the effect key 16 is depressed (step S23). If the effect key 16 is not depressed, the flow returns to step S17 to perform image sensing processing for the next image for the
10 panorama image.

If the CPU 36 determines that the effect key 16 is depressed, the CPU 36 terminates the image sensing processing for a plurality of image data for the panorama image, and calculates the total number of
15 image data sensed for the panorama image (the number of images to be combined into the panorama image) (step S24).

The CPU 36 generates synthesis condition data for the respective image data on the basis of the
20 calculated number of images to be combined into a panorama image, the photographing direction of the panorama image set in the image sensing condition setting processing (see FIG. 5), and the image sensing order of the respective image data sensed for the
25 panorama image (the order in which the images are stored in the flash memory 31, i.e., ascending order of the page No. data) (step S25).

If, for example, the number of images to be combined into a panorama image is three, and the horizontal direction from the left to right is set as the photographing direction of the panorama image, the synthesis condition data of the respective image data sensed for the panorama image are respectively written as "3R-1", "3R-2", and "3R-3" in ascending order of the page No. data.

After the CPU 36 stores the respective generated synthesis condition data in the flash memory 31 in correspondence with the above image data (step S26), this panorama image sensing processing is terminated.

The above description pertains to the sequence of the panorama image sensing processing executed by the CPU 36.

In the above panorama image sensing processing, for the sake of convenience, the horizontal direction from the left to right is set as the photographing direction of the panorama image. However, for example, the horizontal direction from the right to left, the vertical direction from the bottom to top, or the vertical direction from the top to bottom can also be set as the photographing direction of the panorama image. In this case, in photographing the second or subsequent image, the reproduced image display area 12b and the through screen area 12c are set on the display unit 12 (finder), as shown in FIGS. 10A through 10C.

FIG. 11 shows a modification of the set state, in which reproduced image display areas 12b1 through 12b4 and the through screen area 12c are set on the display unit 12 (finder) in photographing the second or
5 subsequent image data in the panorama photographing mode.

In this modification, when the first image data is sensed, as shown in FIG. 11A, the CPU 36 sets the reproduced image display areas 12b1 through 12b4 and
10 the through screen area 12c on the display screen, as shown in FIG. 11B. The CPU 36 then acquires images corresponding to the areas sizes of the reproduced image display areas 12b1 through 12b4 from the four end portions of the first sensed image data, as shown in
15 FIG. 11A, and reproduces/displays the acquired images in the reproduced image display areas 12b1 through 12b4 on the display screen, and also displays the object image received through the image sensing lens 11 in the through screen area 12c.

20 With this display control for the finder, the photographing direction of the panorama image can be set by sensing the second image while matching the position of the object image displayed in the through screen area 12c with one of the end portion images of
25 the first sensed image reproduced/displayed in the reproduced image display areas 12b1 through 12b4 of the display unit 12. This obviates the need for setting

the photographing direction in the image sensing condition setting processing (see FIG. 5) before photographing operation.

5 The reproduction display processing executed by the CPU 36 of the digital camera 1 will be described next with reference to the flow charts of FIGS. 12 through 19 and the display examples shown in FIGS. 20A through 20D.

10 Assume, for the sake of convenience, that in the following reproduction display processing, the image data corresponding to page No. data "1" in the flash memory 31 is not image data for a panorama image, but is normal sensed image data. That is, the panorama flag data of the image data corresponding to page
15 No. data "1" is "0".

When the mode switch 13 is slid to designate the reproduction mode, the CPU 36 reads out the program associated with reproduction display processing from the ROM 33, and starts the processing.

20 First of all, the CPU 36 performs initialization processing such as initialization (step S31). The CPU 36 then reads out the image data corresponding to page No. data "1" from, for example, the 64 image data stored in the flash memory 31, and makes the
25 compression/decompression circuit 30 decompress the image data. Upon storing the decompressed data in the DRAM 29, the CPU 36 causes the signal generator 25 to

convert the data into a video signal by, for example, adding a sync signal to the data and output it to the display unit 12 through the VRAM 26, the D/A converter 27, and the amplifier 28, thereby reproducing/
5 displaying the image data on the display screen (step S32).

Subsequently, the CPU 36 checks whether the "+" key 17a or the "-" key 17b is depressed (step S33). If the CPU 36 determines that neither the key 17a nor
10 the key 17b is depressed, the CPU 36 keeps checking whether the "+" key 17a or the "-" key 17b is depressed.

Assume that the CPU 36 determines that either the "+" key 17a or the "-" key 17b is depressed. In this case, processing is performed in accordance with the
15 depressed key. If the "+" key 17a is depressed, the panorama flag data of the image data corresponding to the next page No. data is read out from the flash memory 31. If, for example, the page No. data of the image data currently reproduced/displayed on the
20 display unit 12 is "1", this page No. data is incremented by (+1), and the panorama flag data of the image data corresponding to page No. data "2" is read out from the flash memory 31. If the "-" key 17b is
25 depressed, the panorama flag data of the image data corresponding to the immediately preceding page No. data is read out from the flash memory 31. If, for example, the page No. data of the image data currently

reproduced/displayed on the display unit 12 is "8",
this page No. data is decremented by (-1), and the
panorama flag data of the image data corresponding to
page No. data "7" is read out from the flash memory 31
5 (step S34).

The CPU 36 checks whether the read panorama flag
data is "1" (step S35). If the panorama flag data is
not "1", i.e., the panorama flag data is "0", the CPU
36 determines that this image data is normal sensed
10 image data. The CPU 36 then reads out the image data
from the flash memory 31 and causes the compression/
decompression circuit 30 to decompress the image data
and store it in the DRAM 29. Then, the CPU 36 causes
the signal generator 25 to convert the image data into
15 a video signal by, for example, adding a sync signal to
the data and output the signal to the display unit 12,
thereby reproducing/displaying the image data on the
display screen (step S36). After that, the flow
returns to step S33.

20 If the CPU 36 determines in step S35 that the
panorama flag data is "1", the CPU 36 determines that
this image data is one of a plurality of image data
sensed for a panorama image, and reads out the
synthesis condition data stored in the flash memory 31
25 in correspondence with this image data (step S37).

The CPU 36 then reads out the respective image
data forming the panorama image on the basis of this

synthesis condition data. If, for example, the synthesis condition data is "3R-1", since the joint picture count data is "3" (three image data), the CPU 36 sequentially reads out the three image data, which are stored in the flash memory 31 upon assignment of the consecutive page No. data thereto by the above panorama image sensing processing (see FIG. 7), from the flash memory 31, and directs the compression/decompression circuit 30 to decompress the image data and transfer the data to the DRAM 29 (step S38).

After this operation, the CPU 36 sets the joining directions and joining order of the respective image data transferred to the DRAM 29 on the basis of the synthesis condition data (photographing direction data and image sensing order data), and synthesizes the respective image data to generate panorama image data (step S39).

In this case, the CPU 36 deletes an end portion image of the second or subsequent image data which overlaps the immediately preceding sensed image (the left end image of the sensed image in FIG. 9D which corresponds to the reproduced image display area 12b in FIG. 9C; the image in the area enclosed within the dashed line in FIG. 13A), and performs joining/synthesizing processing. In this synthesizing processing, the joined boundary portions of the respective image data may be compared with each other

to perform color or brightness correction or image processing, e.g, blurring the joined boundary portions.

The CPU 36 transfers the generated panorama image data to the signal generator 25 and directs it to
5 convert the image data into a video signal (display data) by, for example, adding a sync signal to the data, and to temporarily store the panorama image data in the VRAM 26 (step S40). The signal generator 25 outputs the first 1-frame image data (e.g., the 1-frame image
10 data of the left end, the right end, the upper end, the lower end, or the central portion) of the panorama image data (display data) stored in the VRAM 26 to the display unit 12 through the D/A converter 27 and the amplifier 28. Then, as shown in FIG. 20B (in this case,
15 the 1-frame image data of the left end of the panorama image data is being displayed first), the image data is reproduced/displayed on the display screen, and the panorama image mark 12d "P" indicating that the displayed image is a panorama image is displayed on the
20 upper right corner of the display screen (step S41).

Control may be changed to display a message (e.g., "PANORAMA" in FIG. 13D) indicating that the displayed image is a panorama image or a displayed portion
notification mark (e.g., the mark shown in FIG. 13C)
25 indicating which part of the panorama image is currently displayed instead of the panorama image mark 12d "P".

Subsequently, the CPU 36 checks whether the "+" key 17a or the "-" key 17b is depressed (step S42). If the CPU 36 determines that neither the key 17a nor the key 17b is depressed, the flow advances to step S44.

5 If the CPU 36 determines that either the key 17a or 17b is depressed, the CPU 36 scrolls the panorama image in accordance with the depressed key. If, for example, the panorama image currently reproduced/
10 displayed on the display unit 12 is a landscape image as shown in FIG. 20B, the CPU 36 scrolls the displayed image on the display screen to the right in accordance with depression of the "+" key 17a, or scrolls the displayed image on the display screen to the left in accordance with depression of the "-" key 17b
15 (step S43).

More specifically, the CPU 36 sends a scrolling direction control signal to the signal generator 25 in accordance with the depressed key. The signal generator 25 continuously changes/controls the 1-frame
20 image data read out from the VRAM 26 in accordance with this scrolling direction control signal, thereby making the display unit 12 scroll the panorama image.

While the panorama image is scrolled on the display screen, the panorama image mark 12d "P" is kept
25 displayed on the right upper corner of the display screen. If the reproduced/displayed panorama image is a portrait image, the CPU 36 scrolls the displayed

image on the display screen upward or downward in accordance with depression of the "+" key 17a or the "-" key 17b.

5 The CPU 36 then checks whether the effect key 16 is depressed (step S44). If the effect key 16 is not depressed, the flow returns to step S42. If the CPU 36 determines that the effect key 16 is depressed, the CPU 36 determines that reproduction/display of the panorama image is to be terminated, and makes the numerical
10 value of the page No. data skip to the largest value of the page No. data of the respective image data forming the reproduced/displayed panorama image (step S45). Thereafter, the flow returns to step S33.

15 When the mode switch 13 is slid during execution of this reproduction display processing to designate a shift to a mode other than the reproduction mode, the CPU 36 terminates the reproduction display processing.

The above description relates to the sequence of the reproduction display processing executed by the CPU
20 36 of the digital camera 1.

In the above reproduction display processing (see FIG. 12), a normal sensed image and a panorama image are reproduced/displayed on the display unit 12 of the digital camera 1. Obviously, however, if an external
25 device such as a TV receiver is connected to the video output terminal 18b of the digital camera 1 through a video cable, similar reproduction display processing

can be performed on the display screen of the device.

Note that the processing shown in FIG. 13 may be performed instead of the processing in step S41 in the above reproduction display processing (see FIG. 12).

5 After the panorama image is stored in the VRAM 26 in step S40, a central portion (1-frame portion) of the panorama image is detected (step S41-1).

 If, for example, the panorama image is composed of three sensed images, the second sensed image is
10 extracted. If the panorama image is composed of four sensed images, halves of the second and third sensed images are extracted.

 After the above operation, 1-frame image data of the central portion extracted in step S41-1 is
15 transferred to the display unit 12 to be reproduced/ displayed on the display screen, as shown in FIG. 20C. In addition, a displayed portion notification mark (also indicating that the displayed image is a panorama image) indicating which part of the panorama image is
20 currently displayed is displayed on the lower right corner of the display screen (step S41-2).

 The flow then advances to step S42.

 The processing in step S43 (scrolling processing) in the above reproduction display processing (see
25 FIG. 12) will be described next with reference to the flow chart of FIG. 14.

 First of all, the CPU 36 checks whether the key

depressed in step S42 is the "+" key 17a or the "-" key 17b (step SA1).

5 If the CPU 36 determines that the "+" key 17a is depressed, the CPU 36 checks whether the panorama image data stored in the VRAM 26 is a landscape image (step SA2).

10 If the CPU 36 determines that the panorama image is a landscape image, the CPU 36 checks whether the right end image of the panorama image is being displayed on the display unit 12 (step SA3). If the right end image is not displayed, the CPU 36 scrolls the displayed image on the display screen to the right (step SA4), and the flow shifts to step S44.

15 If the CPU 36 determines in step SA3 that the right end image is being displayed, i.e., no image data to be displayed on the further right side of the display unit 12 is stored in the VRAM 26, the flow shifts to step S44 without scrolling the displayed image.

20 If the CPU 36 determines in step SA2 that the image is not a landscape image but a portrait image, the CPU 36 checks whether the upper end image of the panorama image is being displayed on the display unit 12 (step SA5). If the upper end image is not
25 displayed, the CPU 36 scrolls the displayed image on the display screen upward (step SA6), and the flow shifts to step S44.

If the CPU 36 determines in step SA5 that the upper end image is being displayed, the flow shifts to step S44 without scrolling the displayed image.

5 If the CPU 36 determines in step SA1 that the "-" key 17b is depressed, the CPU 36 checks whether the panorama image data is a landscape image, as in the processing in step SA2 (step SA7).

10 If the CPU 36 determines that the data is a landscape image, the CPU 36 checks whether the left end image of the panorama image (see FIG. 20B) is being displayed on the display unit 12 (step SA8). If the left end image is not being displayed, the CPU 36 scrolls the displayed image on the display screen to the left (step SA9). The flow then shifts to step S44.

15 If the CPU 36 determines in step SA8 that the left end image is being displayed, the flow shifts to step S44 without scrolling the displayed image.

20 If the CPU 36 determines in step SA7 that the image is not a landscape image but is a portrait image, the CPU 36 checks whether the lower end image of the panorama image is being displayed on the display unit 12 (step SA10). If the lower end image is not being displayed, the CPU 36 scrolls the displayed image on the display screen downward (step SA11). The flow then shifts to step S44.

25

If the CPU 36 determines in step SA10 that the lower end image is being displayed, the flow shifts to

step S44 without scrolling the displayed image.

The above description concerns the sequence of scrolling processing (the processing in step S43 in FIG. 12) executed by the CPU 36 of the digital camera 1.

5 In the above scrolling processing in FIG. 14, while the "+" key 17a or the "-" key 17b is depressed, scrolling processing is executed. However, control may be changed to start scrolling at the instant the "+" key 17a or the "-" key 17b is depressed, and stop it
10 when a stop key (e.g., the effect key 16) is depressed.

The above scrolling processing (the processing in step S43 in FIG. 12) may be performed by the control shown in FIGS. 15 through 17.

15 Modifications 1 and 2 of this scrolling processing will be described below.

Modification 1 of the scrolling processing, which is shown in FIGS. 15 and 16, will be described first.

20 In modification 1 of the scrolling processing, first of all, the CPU 36 checks whether the key depressed in step S42 is the "+" key 17a or the "-" key 17b (step SB1).

25 If the CPU 36 determines that the "+" key 17a is depressed, the CPU 36 checks whether the panorama image data stored in the CPU 36 is a landscape image (step SB2).

If the CPU 36 determines that the data is a landscape image, the CPU 36 checks whether the right

end image of the panorama image is being displayed on the display unit 12 (step SB3). If the right end image is not being displayed, the CPU 36 starts scrolling the displayed image on the display screen to the right (step SB4).

5 The CPU 36 then checks whether the effect key 16 is depressed (step SB5). If the effect key 16 is depressed, the CPU 36 stops the rightward scrolling performed in step SB4. The flow then shifts to step 10 S44 in FIG. 12.

If the CPU 36 does not detect depression of the effect key 16 in step SB5, the flow returns to step SB3, and the CPU 36 keeps executing the rightward scrolling in step SB4 until the CPU 36 determines in step SB3 15 that the right end image is being displayed on the display unit 12 or determines in step SB5 that the effect key 16 is depressed.

If the CPU 36 determines in step SB3 that the right end image is being displayed, the CPU 36 starts 20 scrolling the displayed image on the display screen to the left (step SB6).

That is, the scrolling direction is reversed.

Subsequently, the CPU 36 keeps executing the leftward scrolling in step SB6 until the CPU 36 25 determines in step SB7 that the left end image is being displayed on the display unit 12 or determines in step SB8 that the effect key 16 is depressed.

If depression of the effect key 16 is detected in step SB8, the leftward scrolling in step SB6 is stopped. The flow then shifts to step S44 in FIG. 12.

5 It the CPU 36 determines in step SB7 that the left end image is being displayed, the flow shifts to step SB4 to start scrolling the displayed image on the display screen to the right (opposite direction).

If the CPU 36 determines in step SB2 that the image is not a landscape image but is a portrait image,
10 the CPU 36 checks whether the upper end image of the panorama image is being displayed on the display unit 12 (step SB9). If the upper end image is not being displayed, the CPU 36 starts scrolling the displayed image on the display screen upward (step SB10).

15 Subsequently, the CPU 36 checks whether the effect key 16 is depressed (step SB11). If depression of the effect key 16 is detected, the CPU 36 stops the upward scrolling in step SB10. The flow then shifts to step S44 in FIG. 12.

20 If depression of the effect key 16 is not detected in step SB11, the flow returns to step SB9. Subsequently, the CPU 36 keeps executing the upward scrolling in step SB10 until the CPU 36 determines in step SB9 that the upper end image is being displayed or
25 determines in step SB11 that the effect key 16 is depressed.

If the CPU 36 determines in step SB9 that the

upper end image is being displayed on the display unit 12, the CPU 36 starts scrolling the displayed image on the display screen downward (step SB12).

Subsequently, the CPU 36 keeps executing the
5 downward scrolling in step SB12 until the CPU 36 determines in step SB13 that the lower end image is being displayed or determines in step SB14 that the effect key 16 is depressed.

If depression of the effect key 16 is detected in
10 step SB14, the CPU 36 stops the scrolling processing performed in step SB12. The flow then shifts to step S44 in FIG. 12.

If the CPU 36 determines in step SB13 that the lower end image is being displayed on the display unit
15 12, the flow shifts to step SB10 to start scrolling the displayed image on the display screen upward.

If the CPU 36 determines in step SB1 that the "-" key 17b is depressed, the CPU 36 checks whether the panorama image data stored in the VRAM 26 is a
20 landscape image (step SB15).

If the CPU 36 determines that the data is a landscape image, the CPU 36 checks whether the left end image of the panorama image is being displayed on the display unit 12 (step SB16). If the left end image
25 is not being displayed, the CPU 36 starts scrolling the displayed image on the display screen to the left (step SB17).

The CPU 36 then checks whether the effect key 16 is depressed (step SB18). If depression of the effect key 16 is detected, the CPU 36 stops the leftward scrolling in step SB17. Thereafter, the flow shifts to step S44 in FIG. 12.

If depression of the effect key 16 is not detected in step SB18, the flow returns to step SB16. Subsequently, the CPU 36 keeps executing the leftward scrolling in step SB17 until the CPU 36 determines in step SB16 that the left end image is being displayed on the display unit 12 or determines in step SB18 that the effect key 16 is depressed.

If the CPU 36 determines in step SB16 that the left end image is being displayed on the display screen, the CPU 36 starts scrolling the displayed image on the display screen to the right (step SB19).

Subsequently, the CPU 36 keeps executing the rightward scrolling in step SB21 until the CPU 36 determines in step SB20 that the right end image is being displayed on the display unit 12 or determines in step SB21 that the effect key 16 is depressed.

If depression of the effect key 16 is detected in step SB21, the CPU 36 stops the rightward scrolling performed in step SB19. The flow then shifts to step S44 in FIG. 12.

If the CPU 36 determines in step SB20 that the right end image is being displayed on the display unit

12, the flow shifts to step SB17 to start scrolling the displayed image on the display screen to the left (opposite direction).

5 If the CPU 36 determines in step SB15 that the image is not a landscape image but is a portrait image, the CPU 36 determines whether the lower end image of the panorama image is being displayed on the display unit 12 (step SB22). If the lower end image is not being displayed, the CPU 36 starts scrolling the
10 displayed image on the display screen downward (step SB23).

The I/O port 37 checks whether the effect key 16 is depressed (step SB24). If depression of the effect key 16 is detected, the CPU 36 stops the downward
15 scrolling performed in step SB23. The flow then shifts to step S44 in FIG. 12.

If depression of the effect key 16 is not detected in step SB24, the flow returns to step SB22. Subsequently, the CPU 36 keeps executing the downward
20 scrolling performed in step SB23 until the CPU 36 determines in step SB22 that the lower end image is being displayed on the display unit 12 or determines in step SB24 that the effect key 16 is depressed.

If the CPU 36 determines in step SB22 that the
25 lower end image is being displayed on the display unit 12, the CPU 36 starts scrolling the displayed image on the display screen upward (step SB25).

Subsequently, the CPU 36 keeps executing the upward scrolling performed in step SB25 until the CPU 36 determines in step SB26 that the upper end image is being displayed or determines in step SB27 that the effect key 16 is depressed.

If detection of the effect key 16 is detected in step SB27, the CPU 36 stops the scrolling processing performed in step SB25. The flow then shifts to step S44 in FIG. 12.

If the CPU 36 determines in step SB26 that the upper end image is being displayed on the display unit 12, the flow shifts to step SB23 to start scrolling the displayed image on the display screen downward.

The above description pertains to the sequence of modification 1 of the scrolling processing executed by the CPU 36 of the digital camera 1.

In modification 1 of the scrolling processing in FIGS. 15 and 16, when the "+" key 17a or the "-" key 17b is depressed, scrolling processing is started; when the effect key 16 is depressed, the scrolling processing is stopped. However, control may be changed to continuously execute scrolling processing while the "+" key 17a or the "-" key 17b is depressed.

In the above reproduction display processing (FIG. 12) and modification 1 (FIGS. 15 and 16) of the scrolling processing, the processing of modification 1 of the scrolling processing is started when the "+"

key 17a or the "-" key 17b is depressed in step S42. However, control may be changed to automatically start scrolling processing of reversing (returning) the scrolling direction at the two ends of the panorama image (the processing in steps SB2 through SB14 or the processing in steps SB15 through SB27) upon selection of reproduction/display of the panorama image by omitting the processing in steps S42 and SB1.

Modification 2 of the scrolling processing shown in FIG. 17 will be described next.

Assume that in modification 2 of the scrolling processing, which will be described below, the panorama image data displayed in step S41 in FIG. 12 is a landscape image (i.e., not a portrait image), for the sake of descriptive convenience.

In modification 2 of the scrolling processing, first of all, the CPU 36 determines whether the key depressed in step S42 is the "+" key 17a or the "-" key 17b (step SC1).

If the CPU 36 determines that the "+" key 17a is depressed, the CPU 36 checks whether the displayed image can be scrolled to the right by the amount corresponding to the depressing operation, i.e., all the image data for 1 frame (1-frame data) required to display the image even after scrolling can be ensured (step SC2).

If the CPU 36 determines in step SC2 that the

displayed image can be scrolled to the right by the amount corresponding to the depressing operation in step S42, the CPU 36 scrolls the displayed image to the right (step SC3). The flow then shifts to step S44.

5 If the CPU 36 determines in step SC2 that the displayed image cannot be scrolled to the right by the amount corresponding to the depressing operation, the CPU 36 also checks whether no (hardly any) image data can be ensured when the displayed image is scrolled to
10 the right by the amount corresponding to the depressing operation (step SC4).

 If the CPU 36 determines that the right end image data can be partially ensured, the CPU 36 joins the left side of the left end image (the image portion
15 indicated by a dashed line 12a in FIG. 20D) to the right side of the right end image (the image portion indicated by the dashed line 12b in FIG. 20D) of the partial right end image of a portion smaller in data amount than 1-frame data, thereby generating 1-frame
20 image data. The CPU 36 then scrolls the displayed image on the display unit 12 (step SC5). Thereafter, the flow shifts to step S44.

 Assume that the displayed image is scrolled to the right in step SC4. In this case, if the CPU 36
25 determines that the image data of the right end cannot be ensured 100%, a 1-frame left end image is displayed on the display unit 12 (step SC6). The flow then

shifts to step S44.

If the CPU 36 determines in step SC1 that the "-" key 17b is depressed, the CPU 36 checks if the displayed image can be scrolled to the left by the amount corresponding to the depressing operation, i.e.,
5 if all data (1-frame image) of one frame required for scrolling can be ensured (step SC7).

If the CPU 36 determines in step SC7 that the displayed image can be scrolled to the left by the amount corresponding to the depressing operation in
10 step S42, the CPU 36 scrolls the image to the right (step SC8). The flow then shifts to step S44.

If the CPU 36 determines in step SC7 that the displayed image cannot be scrolled to the left by the amount corresponding to the depressing operation, the
15 CPU 36 checks whether no image data can be ensured when the displayed image is scrolled to the left by the amount corresponding to the depressing operation (step SC9).

If the CPU 36 determines that the image data of the left end can be partially ensured, the CPU 36 joins the right side of the right end image (the image portion indicated by the dashed line 12b in FIG. 20D) to the left side of the partial left end image (the
20 image portion indicated by the dashed line 12a in FIG. 20D) smaller in data amount than 1-frame image data, thereby generating 1-frame image data and

displaying it on the display unit 12 (step SC10).

The flow then shifts to step S44.

If the CPU 36 determines in step SC9 that the left
end image data cannot be ensured 100% if the displayed
5 image is scrolled to the left, the CPU 36 displays the
right end image of the 1-frame image data (step SC11).
The flow then shifts to step S44.

The above description concerns the sequence of
modification 2 of the scrolling processing executed by
10 the CPU 36 of the digital camera 1.

In modification 2 of the scrolling processing in
FIG. 17, while the "+" key 17a or the "-" key 17b is
depressed, scrolling processing is executed. However,
control may be changed to start scrolling at the
15 instant the "+" key 17a or the "-" key 17b is depressed,
and to stop it when a stop key (e.g., the effect key
16) is depressed.

In modification 2 of the scrolling processing in
FIG. 17, the control configuration may be designed such
20 that the processing in steps SC4 and SC5 and the
processing in steps SC9 and SC10 are omitted, i.e., the
flow immediately shifts to step SC6 (SC11) when NO is
determined in step SC2 (SC7).

In the above reproduction display processing
25 (FIG. 12) and modification 2 (FIG. 17) of the scrolling
processing, when the "+" key 17a or the "-" key 17b is
depressed in step S42, the processing of modification 2

of the scrolling processing is started. However,
control may be changed to start scrolling processing
(the processing in steps SC2 through SC6 or the
processing in steps SC7 to SC11) of scrolling in a
5 predetermined direction upon selection of reproduction/
display of the panorama image by omitting the
processing in steps S42 and SC1.

The above reproduction display processing
(FIG. 12) may be performed by a control configuration
10 like the one shown in FIG. 18.

A modification of this reproduction display
processing will be described below.

In the modification of the reproduction display
processing, the CPU 36 performs initialization
15 processing such as initialization (step SD1) first, and
then sets "1" as page No. data in the work memory 34a
(step SD2).

Thereafter, the CPU 36 reads out the value of the
panorama flag data of the image data corresponding to
20 the page No. data set in the work memory 34a from the
flash memory 31 (step SD3).

The CPU 36 checks whether the read value of the
panorama flag data is "1" (step SD4). If the value of
the panorama flag data is not "1", i.e., the value of
25 the panorama data is "0", the CPU 36 determines that
this image data is normal photographed image data.
The CPU 36 then reads out the image data from the

flash memory 31, directs the compression/decompression circuit 30 to decompress the image data, and stores it in the DRAM 29. The CPU 36 controls the signal generator 25 to convert the image data into a video signal by, e.g., adding a sync signal to the data and output the signal to the display unit 12 through the VRAM 26, the D/A converter 27, and the amplifier 28, thereby reproducing/displaying the image data on the display screen (step SD5).

10 The CPU 36 determines whether a predetermined period of time (e.g., two seconds) has elapsed since reproduction/display of the image data was started in step SD4 (step SD6).

15 If the CPU 36 determines that the predetermined period of time has elapsed, the CPU 36 increments the value of the page No. data set in the work memory 34a (step SD7), and the flow returns to step SD3.

20 If the CPU 36 determines in step SD4 that the value of the panorama flag data is "1", the CPU 36 determines that this image data is one of a plurality of image data sensed for a panorama image. First of all, the CPU 36 reads out the synthesis condition data stored in the flash memory 31 in correspondence with this image data (step SD8).

25 The CPU 36 then sequentially reads out the image data forming the panorama image from the flash memory 31 on the basis of this synthesis condition. If, for

example, the synthesis condition data is "3R-1", since the joint picture count data is "3" (three image data), the CPU 36 sequentially reads out the three image data stored in the flash memory 31 to which the consecutive
5 page No. data are assigned by the above panorama image sensing processing (see FIG. 7). The CPU 36 causes the compression/decompression circuit 30 to decompress the image data and transfers the resultant data to the amplifier 28 (step SD9).

10 After this operation, the CPU 36 sets the joining direction and order of the respective image data transferred to the DRAM 29 on the basis of the synthesis condition data (photographing direction data and image sensing order data), and synthesizes the
15 respective image data to generate panorama image data (step SD10).

The CPU 36 transfers the generated panorama image data to the signal generator 25, and directs it to convert the image data into a video signal by adding
20 a sync signal to the data. The CPU 36 then temporarily stores the panorama image data in the VRAM 26 (step SD11).

The CPU 36 then checks whether the panorama image data stored in the VRAM 26 is landscape image data
25 (step SD12). If the CPU 36 determines that the image data is landscape image data, the CPU 36 reproduces/ displays the left (right) end image (1-frame image

data) of the panorama image on the display screen first, and then continuously scrolls the displayed image to the right (left) until the right (left) end image is reproduced/displayed (step SD13).

5 If the CPU 36 determines in step SD12 that the image data is portrait image data, the CPU 36 reproduces/displays the upper (lower) end image (1-frame image data) of the panorama image on the display screen first, and then continuously scrolls
10 downward (upward) until the lower (upper) end image is reproduced/displayed (step SD14).

 When the right (left) end image or the lower (upper) end image is reproduced/displayed after scrolling in step SD13 or SD14, the CPU 36 changes the
15 value of the page No. data set in the work memory 34a to the value obtained by incrementing the largest value among the page No. data of the respective image data constituting the reproduced/displayed panorama image (step SD15). Thereafter, the flow returns to step SD3.

20 The above description is directed to the sequence of the modification of the reproduction display processing executed by the CPU 36 of the digital camera 1.

 Control may be changed to perform the processing
25 in steps SD12 through SD14 in the modification (FIG. 18) of the reproduction display processing instead of the processing in step S41 in the

reproduction display processing (FIG. 12). That is, when reproduction/display of a panorama image is selected, the panorama image may be automatically scrolled throughout the image. After that, the displayed image may be scrolled when the "+" key 17a or the "-" key 17b is depressed.

Control may be changed to perform the processing in steps SD12 through SD14 in the modification (FIG. 18) of the reproduction display processing instead of the processing in step S43 in the reproduction display processing (FIG. 12). That is, a panorama image may be automatically scrolled throughout the image when the "+" key 17a or the "-" key 17b is depressed.

In addition, the processing shown in FIG. 19 may be performed instead of the processing in step SD13 in the modification (see FIG. 18) of the reproduction display processing.

More specifically, if the CPU 36 determines in step SD12 that the image data is landscape image data, the CPU 36 detects the central portion (1-frame image data) of the panorama image stored in the VRAM 26 (step SE1).

If, for example, the panorama image is composed of three photographed images, the second photographed image is extracted. If the panorama image is composed of four photographed images, halves of the second and

third photographed images are extracted.

After this operation, the CPU 36 transfers the 1-frame image data of the central portion extracted in step SE1 to the display unit 12, and reproduces/
5. displays the image data on the displayed screen, as shown in FIG. 20C (step SE2).

Subsequently, the CPU 36 continuously scrolls the displayed image to the left (right) until the left (right) end image is reproduced/displayed (step SE3).
10 The CPU 36 then reverses the scrolling direction to continuously scroll the displayed image to the right (left) until the right (left) end image is reproduced/displayed (step SE4).

When the right (left) end image is reproduced/
15 displayed, the CPU 36 reverses the scrolling direction and continuously scrolls the displayed image to the left (right) until the image of the central portion is reproduced/displayed (step SE5). Thereafter, the flow shifts to step SD15.

20 Obviously, the processing shown in FIG. 19 can be performed instead of the processing in step SD14 in the modification (see FIG. 18) of the reproduction display processing.

In addition, control may be modified to
25 perform the processing shown in FIG. 19 instead of the processing in step S41 in the reproduction display processing (FIG. 12). That is, when

reproduction/display of a panorama image is selected, scrolling is automatically performed by the method shown in FIG. 19. Thereafter, when the "+" key 17a or the "-" key 17b is depressed, scrolling is performed.

5 The communication processing executed by the CPU 36 of the digital camera 1 will be described next with reference to the flow charts of FIGS. 21 and 22.

 When the mode switch 13 is slid to designate the communication mode, the CPU 36 reads out the program
10 associated with communication processing corresponding to the communication form of data communication performed between the digital camera 1 and an external device from the ROM 33, and starts the processing.

 The communication processing to be described below
15 concerns a case wherein the image data stored in the flash memory 31 of the digital camera 1 is transferred to an external device having an infrared communication function by infrared communication (IrDA scheme) using the infrared communication unit 38.

20 First of all, in steps S51 through S67, the CPU 36 performs processing similar to the processing in steps S31 through S45 in the above reproduction display processing (see FIG. 12) so as to sequentially switch/
 display the normal sensed image data stored in the
25 flash memory 31 and the panorama image data generated by synthesizing a plurality of image data in accordance with depression of the "+" key 17a or the "-" key 17b.

When the shutter key 15 is depressed (step S53 or S63), the CPU 36 designates the image data (normal sensed image data or panorama image data) that is reproduced/displayed when the shutter key 15 is depressed as image data to be transferred to the external device (step S68).

The CPU 36 sets various communication conditions such as the transfer rate, pulse width, and modulation scheme to transfer the data to the distant external device, to which infrared communication (IrDA scheme) is to be performed, in accordance with a predetermined communication protocol (step S69).

After this operation, the CPU 36 transfers the image data (normal sensed image data or panorama image data generated by image synthesis), which is mapped in the DRAM 29 to be reproduced/displayed on the display unit 12 and designated as image data to be transferred, to the compression/decompression circuit 30, and directs the compression/decompression circuit 30 to compress the data. Thereafter, the CPU 36 outputs this image data to the infrared communication unit 38, and transfers the image data from the infrared communication unit 38 to the distant external device by using infrared pulses (step S70).

Upon transmitting a transfer end signal to the distant external device (step S71), the CPU 36 checks whether a reception end signal is received from the

distant external device (step S72). If a reception end signal is received, the communication processing is terminated.

5 The above description pertains to the sequence of communication processing executed by the CPU 36 of the digital camera 1.

10 In this communication processing, a plurality of image data sensed for a panorama image are synthesized into panorama image data, and the panorama image data is transferred to the external device. Instead of this control, control may be changed to transfer the respective images for the panorama image to the external device without being synthesized.

15 In this communication processing, as shown in FIG. 23A, the panorama image data is transferred from the digital camera 1 to the external device by infrared communication (IrDA scheme). However, the panorama image data may be transferred to the external device by various radio communication schemes using radio waves
20 other than the above infrared communication scheme. In addition, the panorama image data may be transferred to the external device by the data communication forms shown in FIGS. 23B through 23D.

25 FIGS. 23A through 23D show data communication forms between the digital camera 1 and the external device.

FIG. 23A shows a case wherein data communication

is performed by infrared communication based on the IrDA scheme. FIG. 23B shows a case wherein data communication is performed through a communication cable (RS-232C type). FIG. 23C shows a case wherein data is exchanged through memory cards. FIG. 23D shows a case wherein data communication is performed through a communication line.

FIG. 23B shows a case wherein both the digital camera 1 and the external device have I/O ports meeting the RS-232C standards, and the digital camera 1 and the external device are connected to each other through a communication cable (RS-232C type). According to the digital camera 1 and the external device connected to each other through the communication cable, panorama image data is transferred from the digital camera 1 to the external device in a serial signal form complying with the RS-232C standards.

FIG. 23C shows a case wherein both the digital camera 1 and the external device have card slots to which memory cards complying with the PCMCIA (Personal Computer Memory Card International Association) standards, and data is exchanged between the digital camera 1 and the external device through memory cards. According to the digital camera 1 and the external device having these card slots, panorama image data is stored in the memory card in the digital camera 1, and this memory card is inserted into the card slot of the

external device, thereby transferring the panorama image data from the digital camera 1 to the external device. Obviously, when data transfer is to be performed through such a storage medium, the storage medium is not limited to the memory card, and other storage media, e.g., a semiconductor memory, a magnetic storage medium, and an optical storage medium, can be used.

FIG. 23D shows a case wherein both the digital camera 1 and the external device have data communication functions corresponding to a communication line, and the digital camera 1 is connected to the external device through a predetermined communication line (e.g., a public network or LAN). According to the digital camera 1 and the external device connected to each other through this communication line, panorama image data is transferred from the digital camera 1 to the external device in a signal form corresponding to the communication line.

The present invention has been described in detail with reference to the embodiment. Obviously, however, the present invention is not limited to the embodiment described above, and various modifications can be made within the spirit and scope of the invention.

In the above embodiment, a plurality of image data sensed for a panorama image are separately stored in the flash memory 31. In reproduction/display or data

transfer, the plurality of image data for the panorama image are synthesized into panorama image data to be reproduced/displayed on the display unit 12 or transferred to an external device. Instead of such a control configuration, control may be changed to synthesize the plurality of sensed image data for the panorama image into panorama image data, and store this panorama image data in the flash memory 31.

In the above embodiment, various control programs are stored in the ROM, and image data obtained by synthesizing sensed image data and a title image is stored in the flash memory. However, storage media for storing these control programs and image data are not limited to the ROM and a semiconductor memory such as a flash memory. For example, magnetic and optical storage media can be used. In addition, this storage medium may be detachably mounted in the apparatus body.

In the above embodiment, panorama image generated by synthesizing a plurality of sensed image data is reproduced/displayed. However, the present invention can be applied to a case wherein panorama image generated by cutting the upper and lower portions of one sensed image data or the image sensed by an image sensing element (or effective pixels) having an aspect ratio different from that of the display unit is reproduced/displayed.

In addition, the present invention can be applied

to a photographed image reproducing apparatus capable of reproducing/displaying photographed image data having an aspect ratio different from that of the display unit as well as an electronic still camera.

5 As is apparent, for example, the present invention can be applied to a portable electronic device or a personal computer which exhibits an image sensing function upon attachment of a PC camera card or the like having a CCD camera and complying with the PCMCIA
10 standards.

C L A I M S

1. An electronic still camera (1) characterized by comprising:

5 photographing means (20, 29, 31, 36) for acquiring image data having an aspect ratio different from that of an image display unit (12); and

 display control means (36) for displaying the image data acquired by said photographing means (20, 29, 31, 36) on said image display unit (12),

10 said display control means (36) further comprising scrolling control means (36) for, when the image data acquired by said photographing means (20, 29, 31, 36) is to be displayed on said image display unit (12), causing said image display unit (12) to display partial
15 image data of the image data, and also causing said image display unit (12) to scroll the image data by consecutively changing/controlling the partial image data to be displayed by said image display unit (12).

2. An electronic still camera (1) according to
20 claim 1, characterized in that said photographing means (20, 29, 31, 36) includes:

 image sensing means (20) for sensing an image of an object to be photographed; and

25 generating means (29, 31, 36) for generating image data having an aspect ratio different from that of said image display unit (12) by using image data sensed by said image sensing means (20).

3. An electronic still camera (1) according to claim 2, characterized in that said generating means (29, 31, 36) generates the image data by synthesizing image data consecutively sensed by said image sensing means (20).

4. An electronic still camera (1) according to claim 3, characterized in that said scrolling control means (36) causes said image display unit (12) to display image data of the image data which corresponds to one frame of said image display unit (12), and also causes said image display unit (12) to scroll the image data by consecutively changing/controlling the 1-frame image data to be displayed by said image display unit (12).

5. An electronic still camera (1) according to claim 1, characterized in that said photographing means (20, 29, 31, 36) further comprises means for acquiring image data having an aspect ratio substantially equal to that of said image display unit (12), and

said display control means (36) further comprises means for causing said image display unit (12) to display image data having an aspect ratio substantially equal to that of said image display unit (12).

6. An electronic still camera (1) according to claim 5, characterized in that said display control means (36) further comprises means for, when said image

display unit (12) is to display image data having an aspect ratio different from that of said image display unit (12), performing notification display (12d) at the same time.

5 7. An electronic still camera (1) according to claim 6, characterized in that the notification display (12d) is performed to indicate which part of the image data is displayed by said image display unit (12).

10 8. An electronic still camera (1) according to claim 1, characterized in that

said camera comprises scrolling designation means (17a, 17b) for designating scrolling of the image data in said image display unit (12), and

15 said scrolling control means (36) for causing said image display unit (12) to scroll the image data by consecutively changing/controlling the partial image data to be displayed by the image display unit (12) in accordance with an instruction from said scrolling designation means (17a, 17b).

20 9. An electronic still camera (1) according to claim 1, characterized in that said scrolling control means (36) includes means for reversing a scrolling direction after partial image data of an end of the image data is displayed by said image display unit (12).

25 10. An electronic still camera (1) according to claim 1, characterized in that said scrolling control means (36) includes means for, after partial image data

of one end of the image data is displayed by said image display unit (12), continuing scrolling by causing said image display unit (12) to display partial image data of the other end of the image data.

5 11. An electronic still camera (1) according to claim 10, characterized in that said scrolling control means (36) includes means for, after partial image data of one end of the image data is displayed by said image display unit (12), synthesizing the partial image data
10 of one end and partial image data of the other end of the image data, and causing said image display unit (12) to display the synthesized image data, thereby continuing continuous scrolling.

15 12. An electronic still camera (1) according to claim 1, characterized in that said scrolling control means (36) for, when the image data acquired by said photographing means (20, 29, 31, 36) is to be displayed by said image display unit (12), causing said image display unit (12) to display partial image data of
20 an end of the image data or partial image data of a central portion of the image data first.

 13. An electronic still camera (1) according to claim 1, characterized in that

 said camera comprises selection means (17a, 17b)
25 for selecting desired image data from a plurality of image data acquired by said photographing means (20, 29, 31, 36), and

said scrolling control means (36) starts scrolling the image data selected by said selection means (17a, 17b).

14. An electronic still camera (1) according to
5 claim 13, characterized in that said scrolling control means (36) stops scrolling after causing said image display unit (12) to scroll the image data from partial image data of one end of the selected image data to partial image data of the other end of the image data
10 by consecutively changing/controlling the partial image data to be displayed by said image display unit (12).

15. An electronic still camera (1) according to claim 1, characterized in that

said camera comprises scrolling designation means
15 (17a, 17b) for designating scrolling of the image data in said image display unit (12), and

said scrolling control means (36) stops scrolling after causing said image display unit (12) to scroll the image data from partial image data of one end of
20 the image data to partial image data of the other end of the image data by consecutively changing/controlling the partial image data to be displayed by said image display unit (12) in accordance with an instruction from said scrolling designation means (17a, 17b).

25 16. An electronic still camera (1) according to claim 1, characterized in that

said camera comprises selection control means (36)

for sequentially switching/selecting one image data
of a plurality of image data acquired by said
photographing means (20, 29, 31, 36),

5 said scrolling control means (36) stops scrolling
after causing said image display unit (12) to scroll
the image data from partial image data of one end of
the image data selected by said selection control means
(36) to partial image data of the other end of the
image data by consecutively changing/controlling the
10 partial image data to be displayed by said image
display unit (12), and

 said selection control means (36) selects the
other image data after the scrolling is stopped.

15 17. An electronic still camera (1) according to
claim 5, characterized in that

 said camera comprises selection means (17, 17b,
36) for selecting one image data of a plurality of
image data acquired by said photographing means (20, 29,
31, 36), and

20 discrimination means (36) for discriminating
whether the image data selected by said selection means
(17a, 17b, 36) is image data having an aspect ratio
different from that of said image display unit (12),
and

25 said scrolling control means (36) starts scrolling
the image data when said discrimination means (36)
discriminates that the selected image data is image

data having an aspect ratio different from that of said image display unit (12).

18. An electronic still camera (1) according to claim 1, characterized in that said photographing means
5 (19, 29, 31, 36) acquires landscape image data and portrait image data each having an aspect ratio different from that of said image display unit (12).

19. An electronic still camera (1) according to claim 18, characterized in that

10 said camera comprises selection means (17, 17b, 36) for selecting one image data of a plurality of image data acquired by said photographing means (20, 29, 31, 36), and

discrimination means (36) for discriminating
15 whether the image data selected by said selection means (17a, 17b, 36) is landscape image data or portrait image data, and

said scrolling control means (36) starts scrolling in a horizontal direction when said discrimination
20 means discriminates that the image data is landscape image data, and starts scrolling in a vertical direction when said discrimination means (36) discriminates that the image data is portrait image data.

20. An electronic still camera (1) according to claim 18, characterized in that

25 said camera comprises scrolling designation means (17a, 17b) for designating scrolling of the image data

in said image display unit (12), and

discrimination means (36) for discriminating whether image data for which scrolling is designated by said scrolling designating means (17a, 17b) is

5 landscape image data or portrait image data, and

said scrolling control means (36) scrolls in a horizontal direction in accordance with an instruction from said scrolling designation means (17a, 17b) when said discrimination means (36) discriminates that the
10 image data is landscape image data, and scrolls in a vertical direction in accordance with an instruction from said scrolling designation means (17a, 17b) when said discrimination means discriminates that the image data is portrait image data.

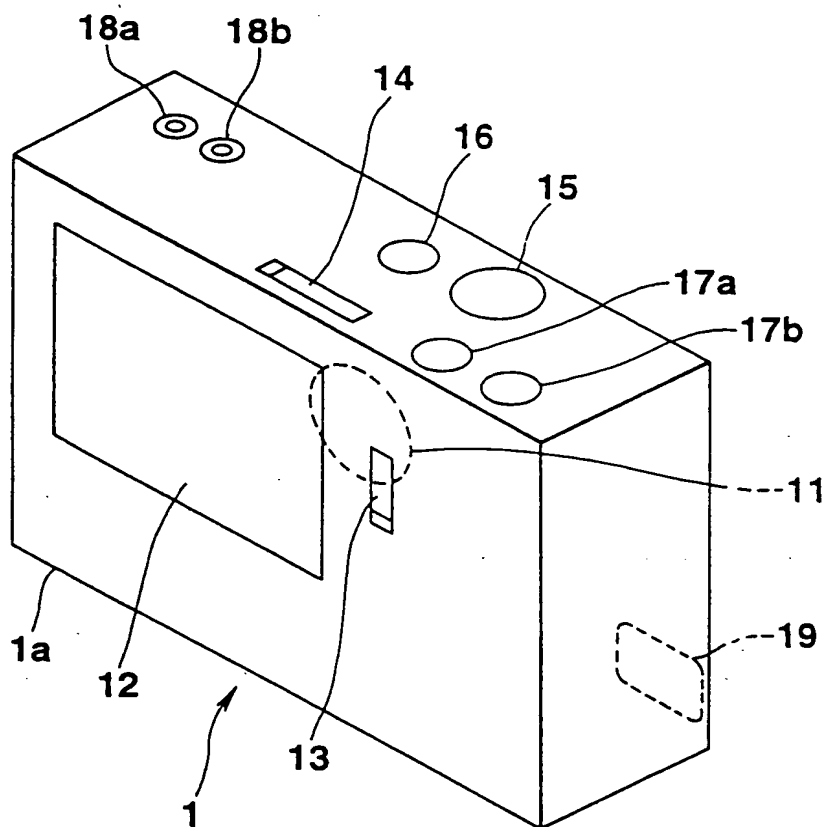
15 21. An image reproducing method characterized by comprising the steps of:

acquiring image data having an aspect ratio different from that of an image display unit;

displaying partial image data of the acquired
20 image data by using said entire image display unit when said image display unit is caused to display the image data; and

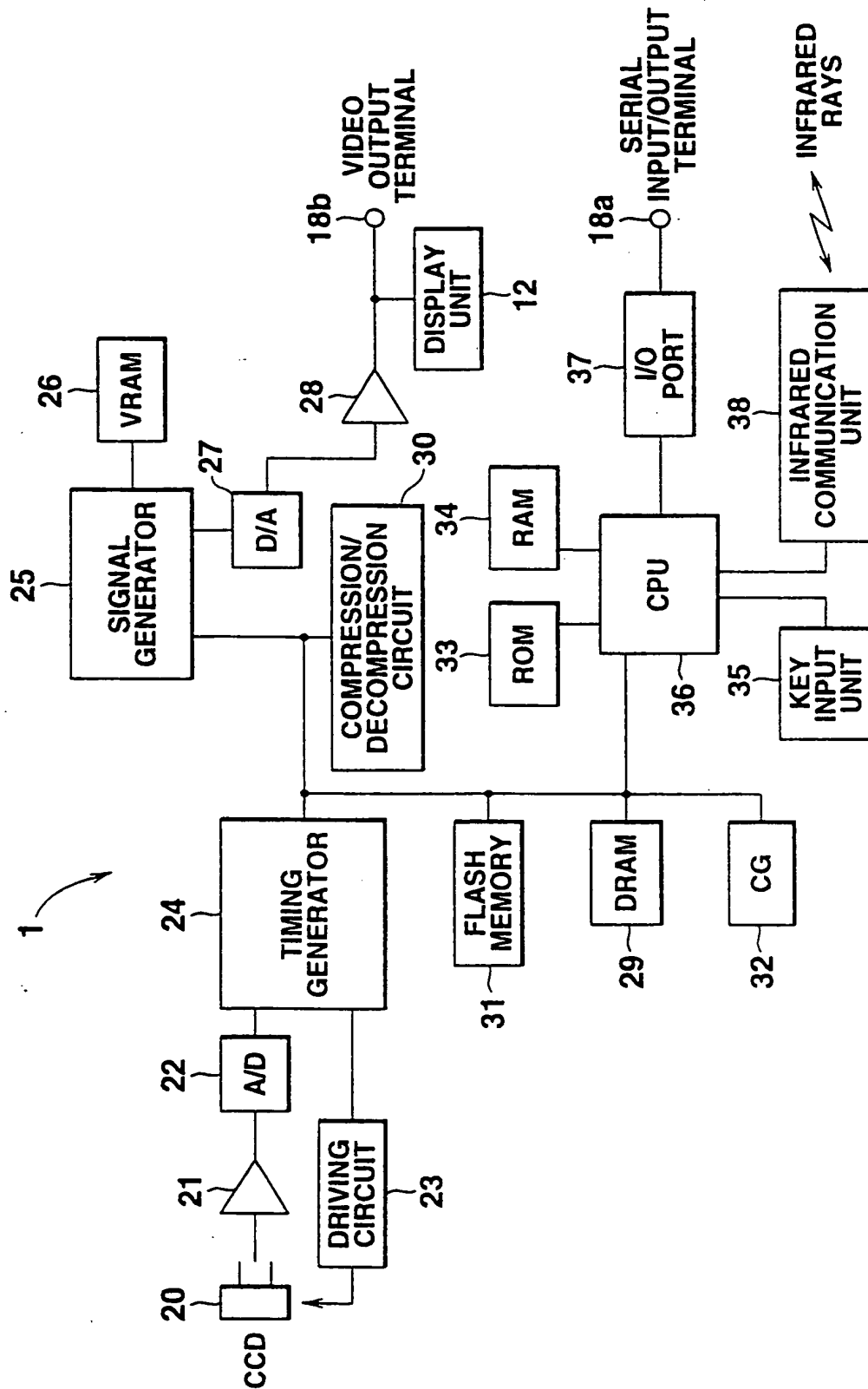
causing said image display unit to scroll the image data by consecutively changing/controlling the
25 partial image data to be displayed by said image display unit.

FIG.1

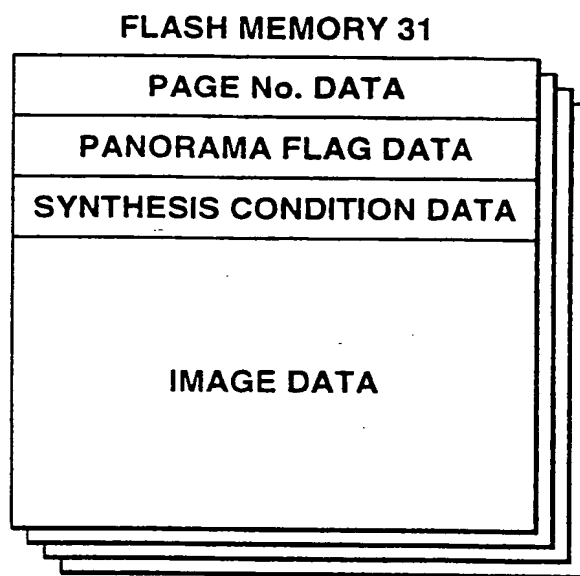
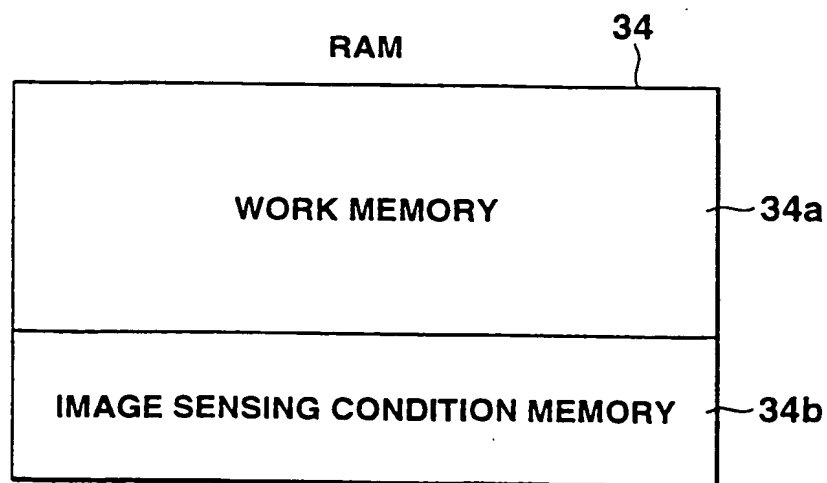


2/22

FIG.2

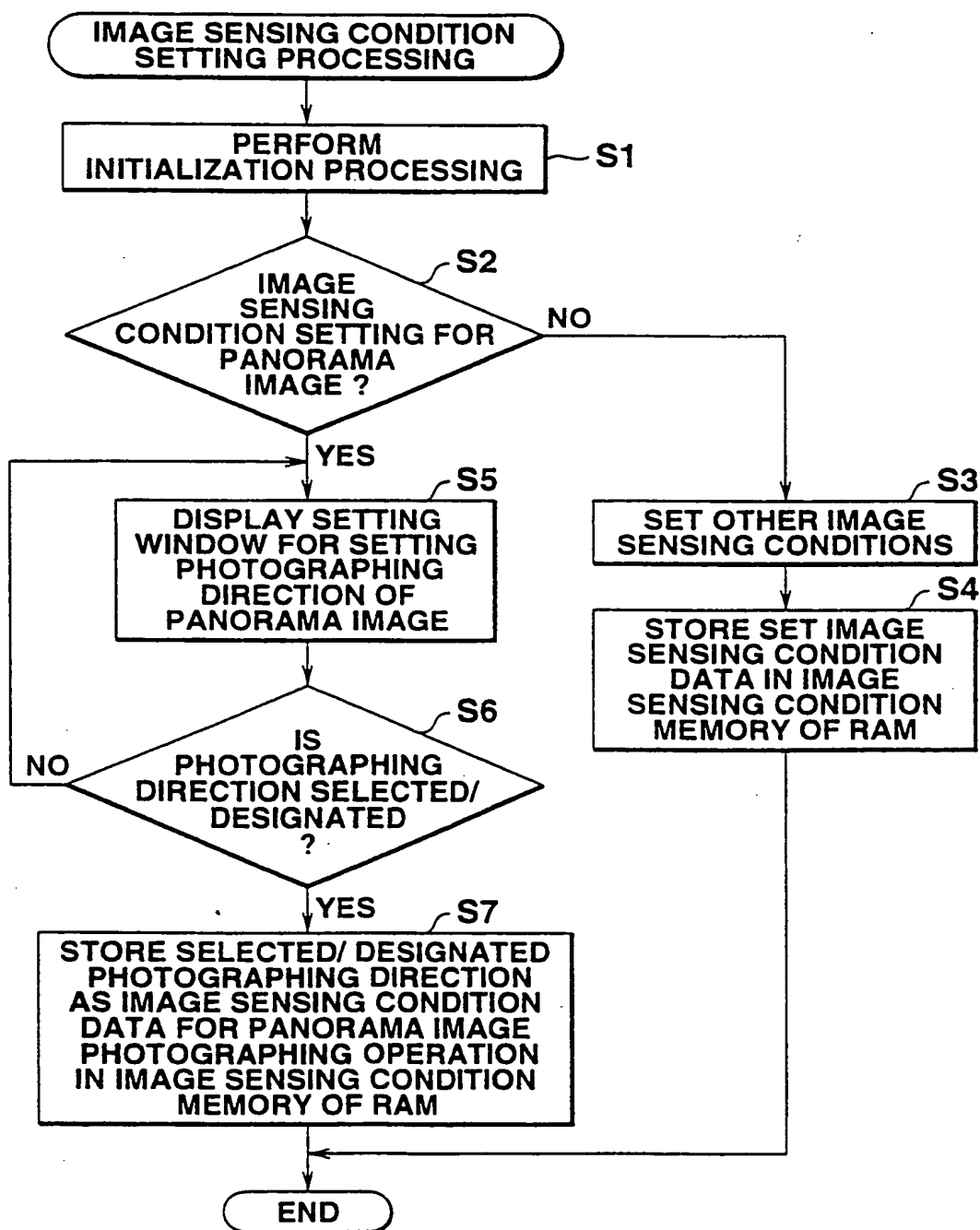


3/22

FIG.3**FIG.4**

4/22

FIG.5



5/22

FIG.6A

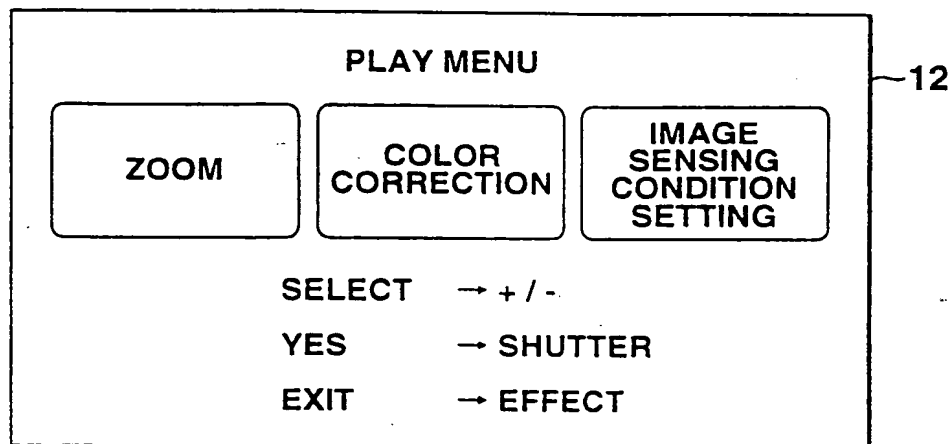
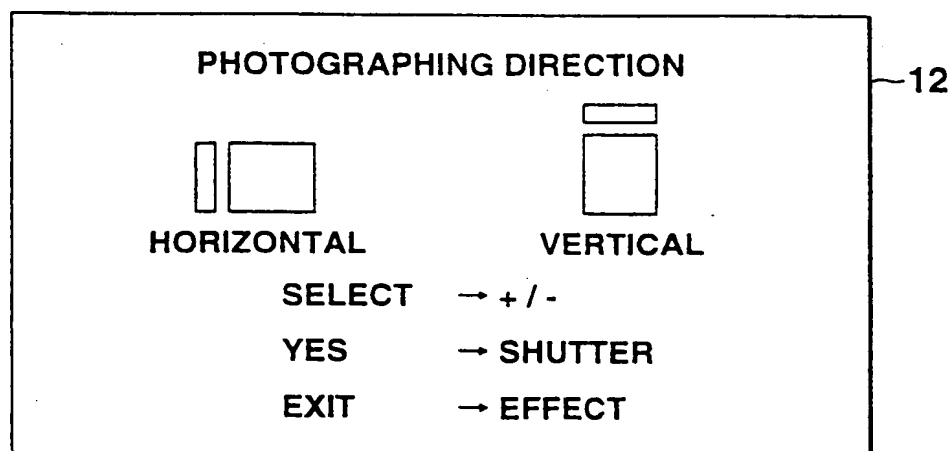
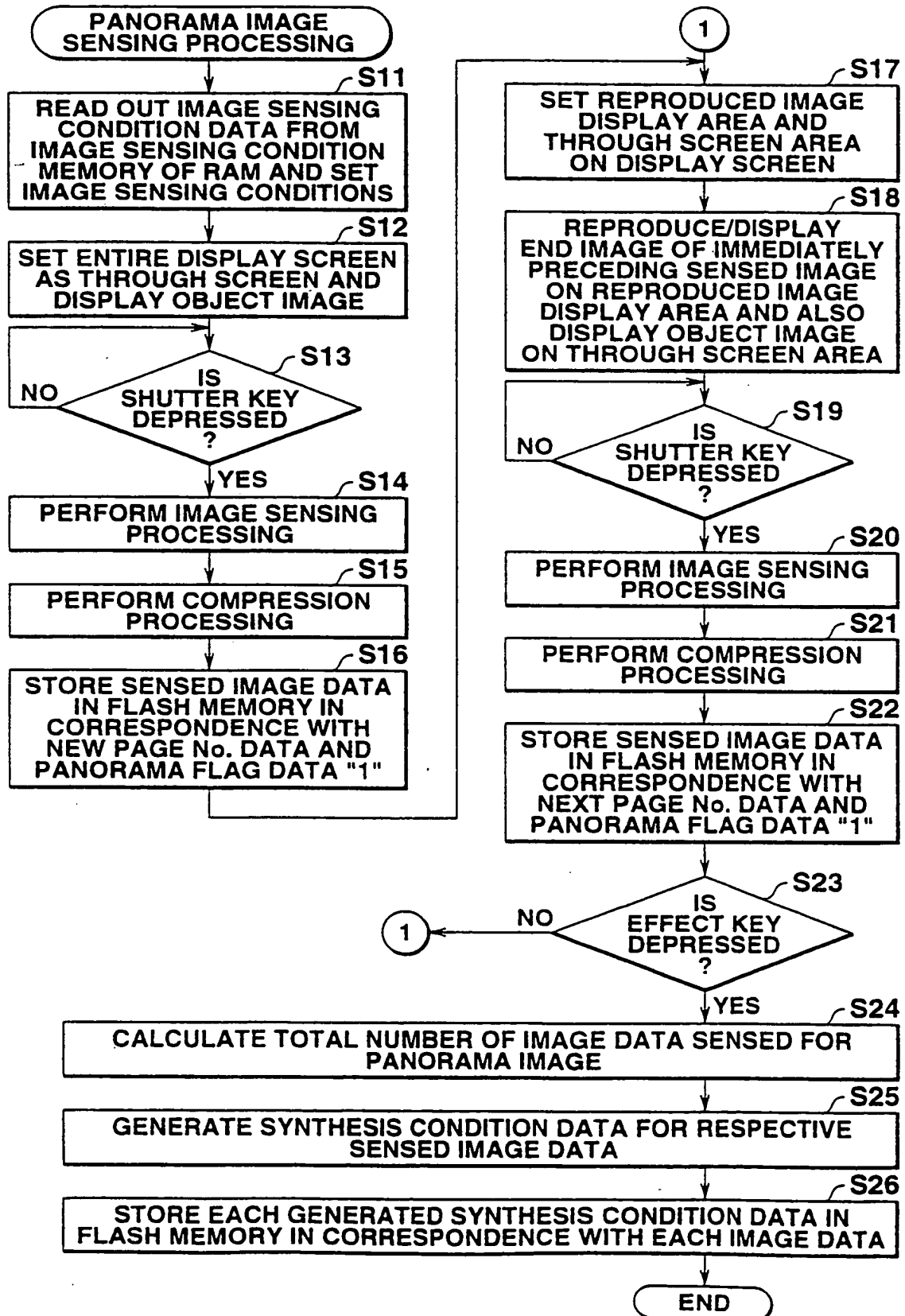


FIG.6B



6/22
FIG.7

7/22

FIG.8A

DISPLAY SCREEN IN PHOTOGRAPHING
OPERATION FOR FIRST IMAGE

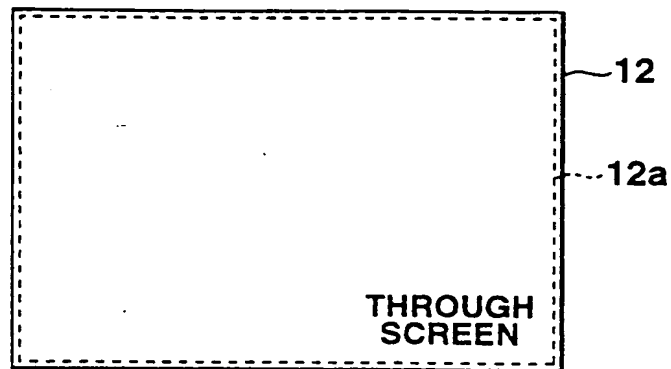
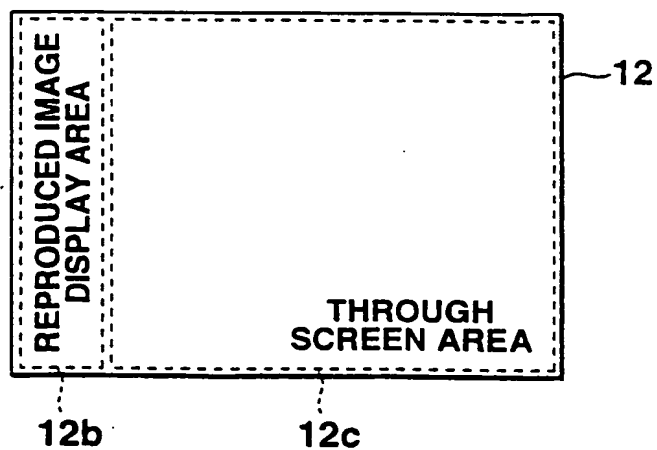


FIG.8B

DISPLAY SCREEN IN PHOTOGRAPHING
OPERATION FOR SECOND OR SUBSEQUENT IMAGE



8/22

FIG.9A

FIRST SENSED IMAGE

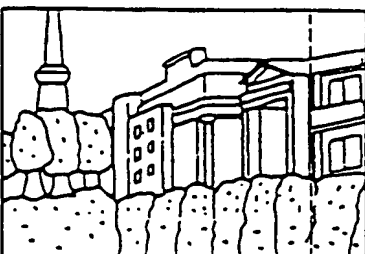


FIG.9B

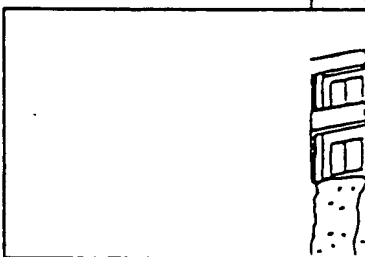


FIG.9C

DISPLAY SCREEN IN
PHOTOGRAPHING OPERATION
FOR SECOND IMAGE

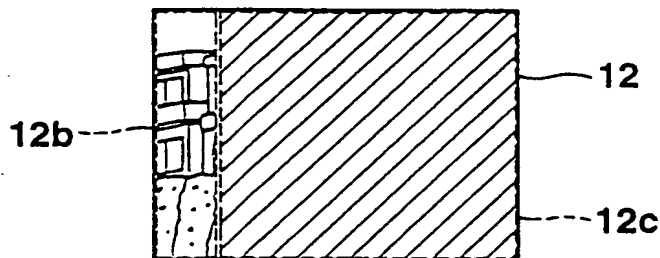
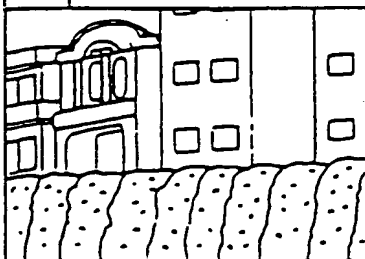


FIG.9D

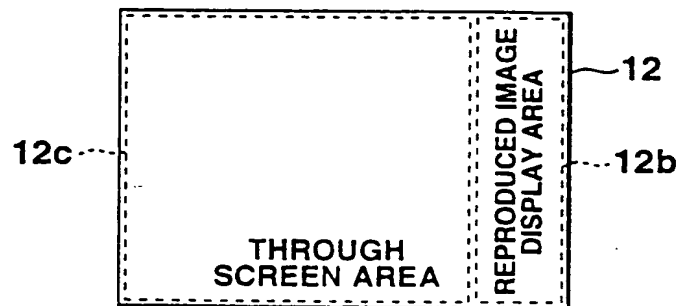
SECOND
SENSED IMAGE



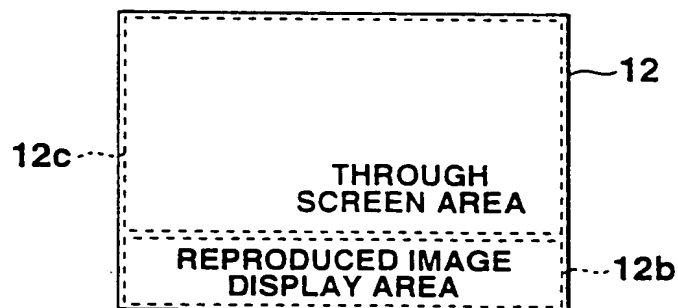
9/22

FIG.10A

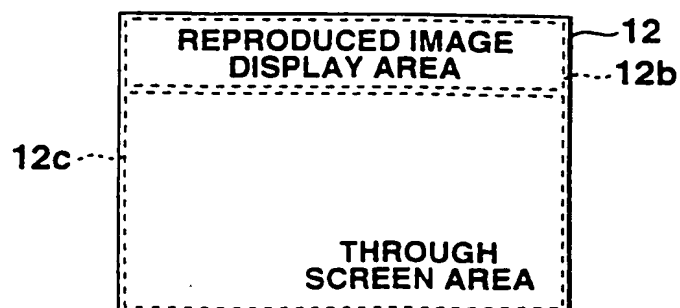
DISPLAY SCREEN SET IN PHOTOGRAPHING
OPERATION FOR SECOND OR SUBSEQUENT IMAGE
WHEN PHOTOGRAPHING DIRECTION OF
PANORAMA IMAGE IS SET TO HORIZONTAL
DIRECTION FROM RIGHT TO LEFT

**FIG.10B**

DISPLAY SCREEN SET IN PHOTOGRAPHING
OPERATION FOR SECOND OR SUBSEQUENT IMAGE
WHEN PHOTOGRAPHING DIRECTION OF
PANORAMA IMAGE IS SET TO VERTICAL
DIRECTION FROM BOTTOM TO TOP

**FIG.10C**

DISPLAY SCREEN SET IN PHOTOGRAPHING
OPERATION FOR SECOND OR SUBSEQUENT IMAGE
WHEN PHOTOGRAPHING DIRECTION OF
PANORAMA IMAGE IS SET TO VERTICAL
DIRECTION FROM TOP TO BOTTOM



10/22

FIG.11A

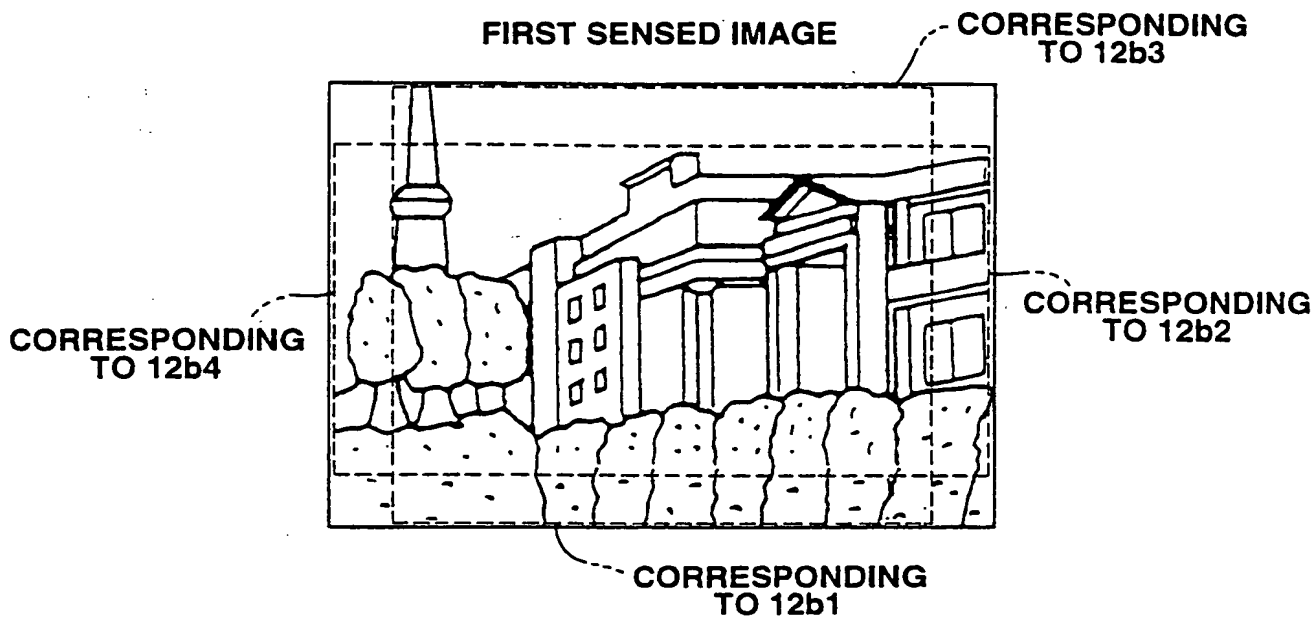
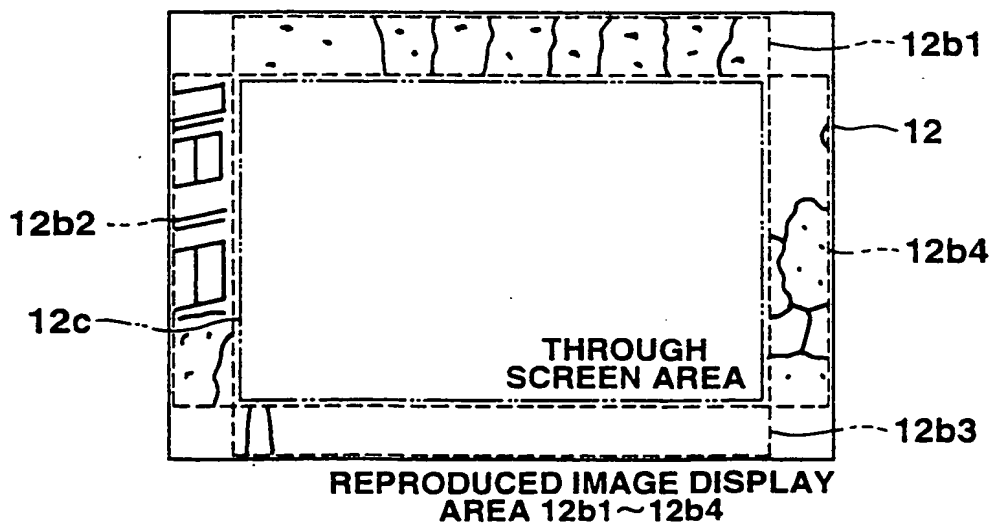


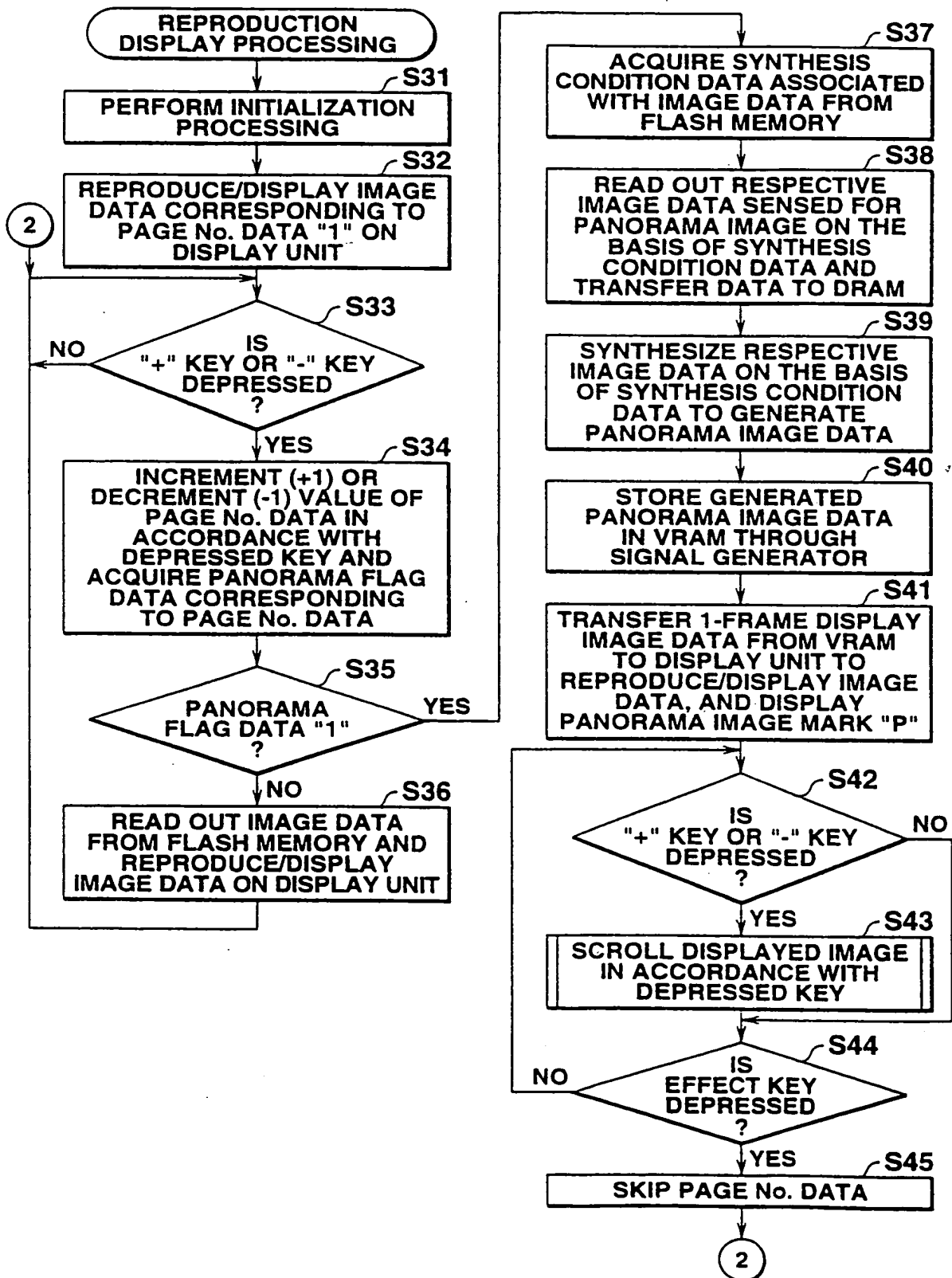
FIG.11B

DISPLAY SCREEN IN PHOTOGRAPHING OPERATION
FOR SECOND OR SUBSEQUENT IMAGE



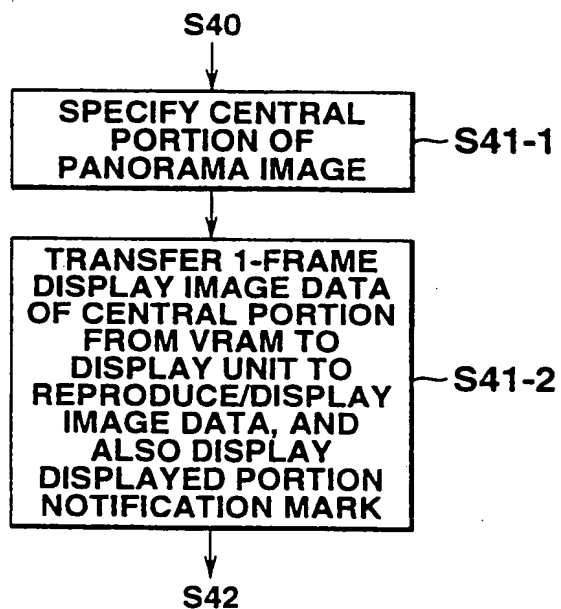
11/22

FIG.12



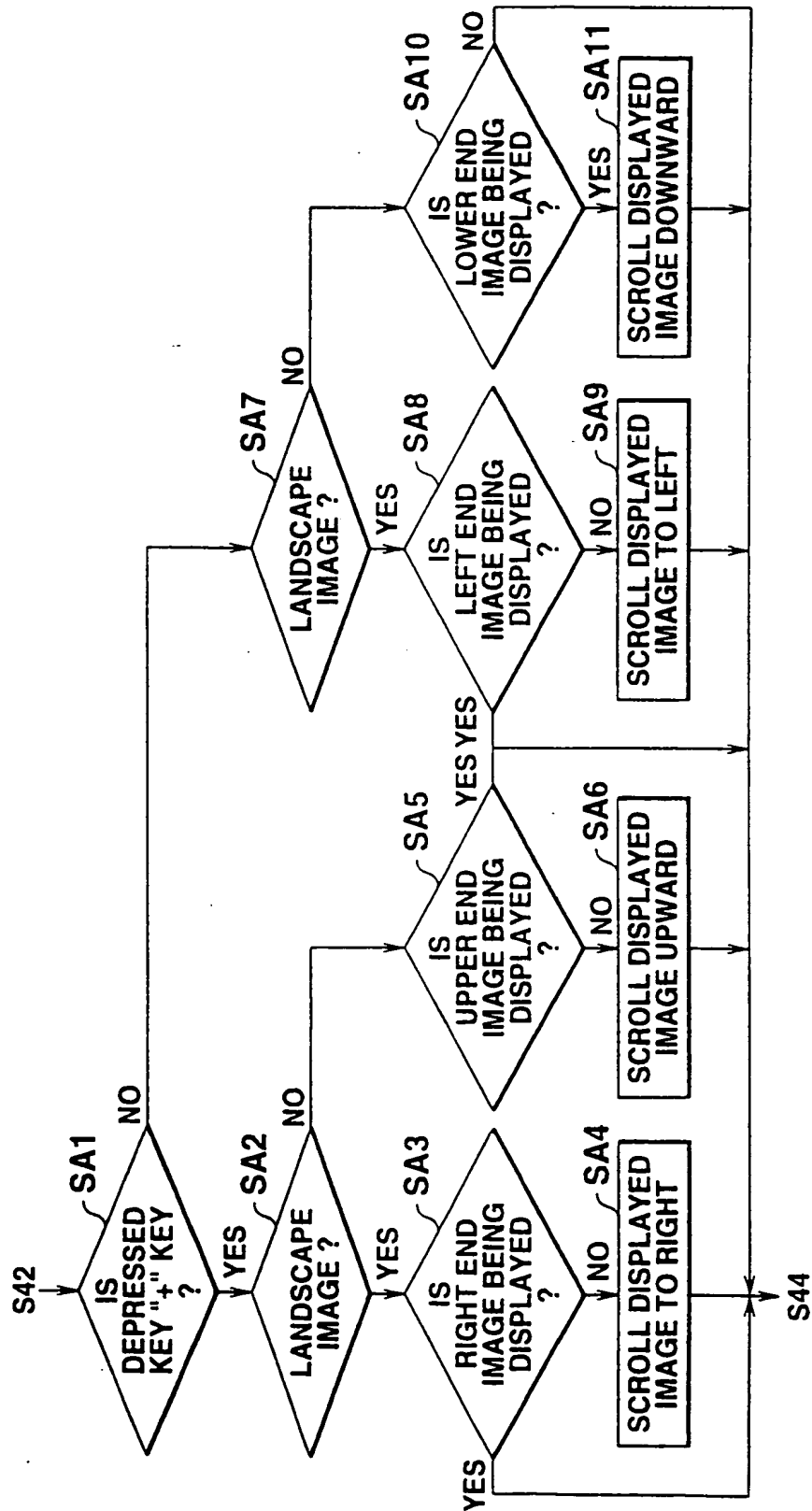
12/22

FIG.13

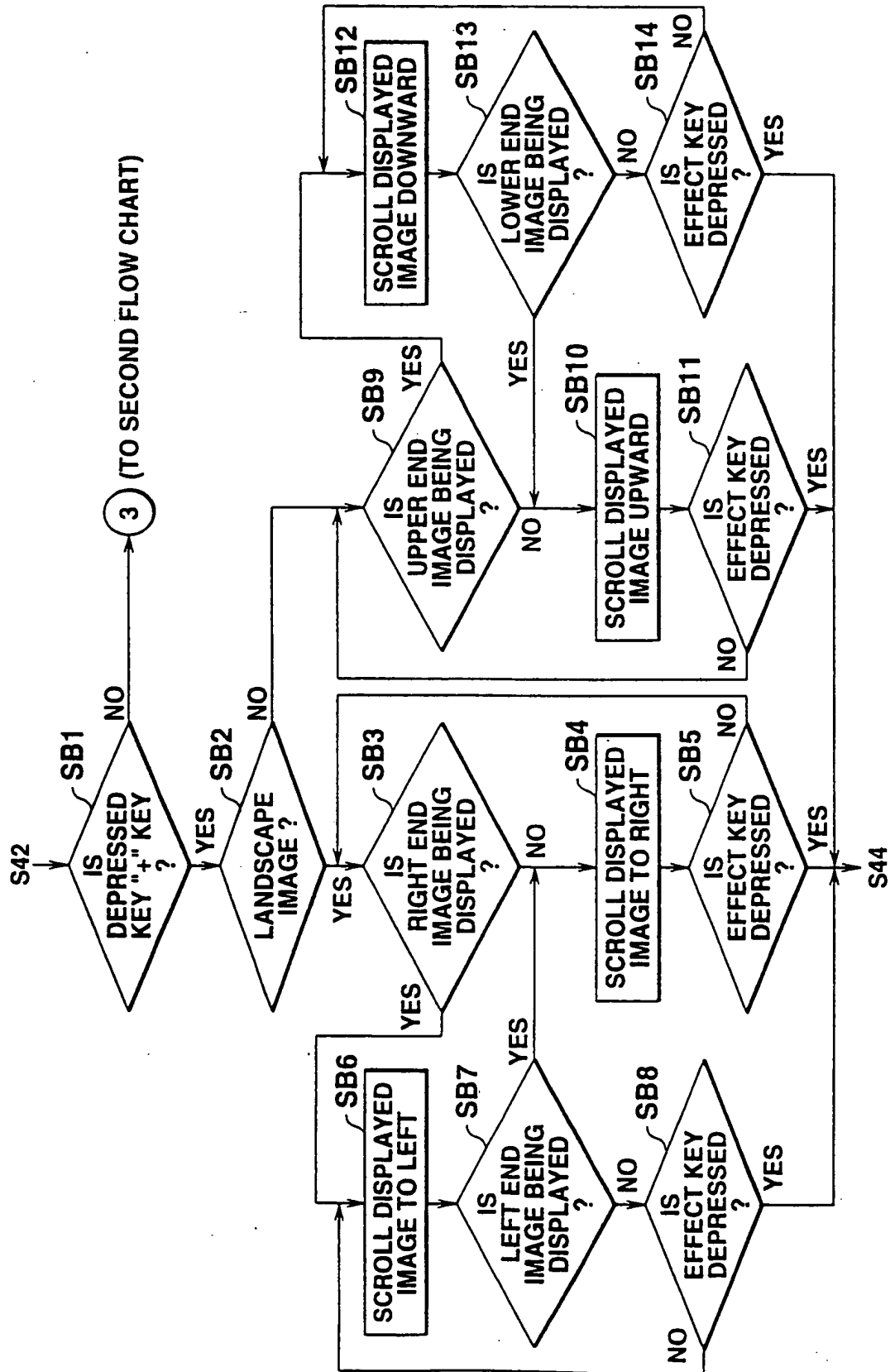


13/22

FIG. 14

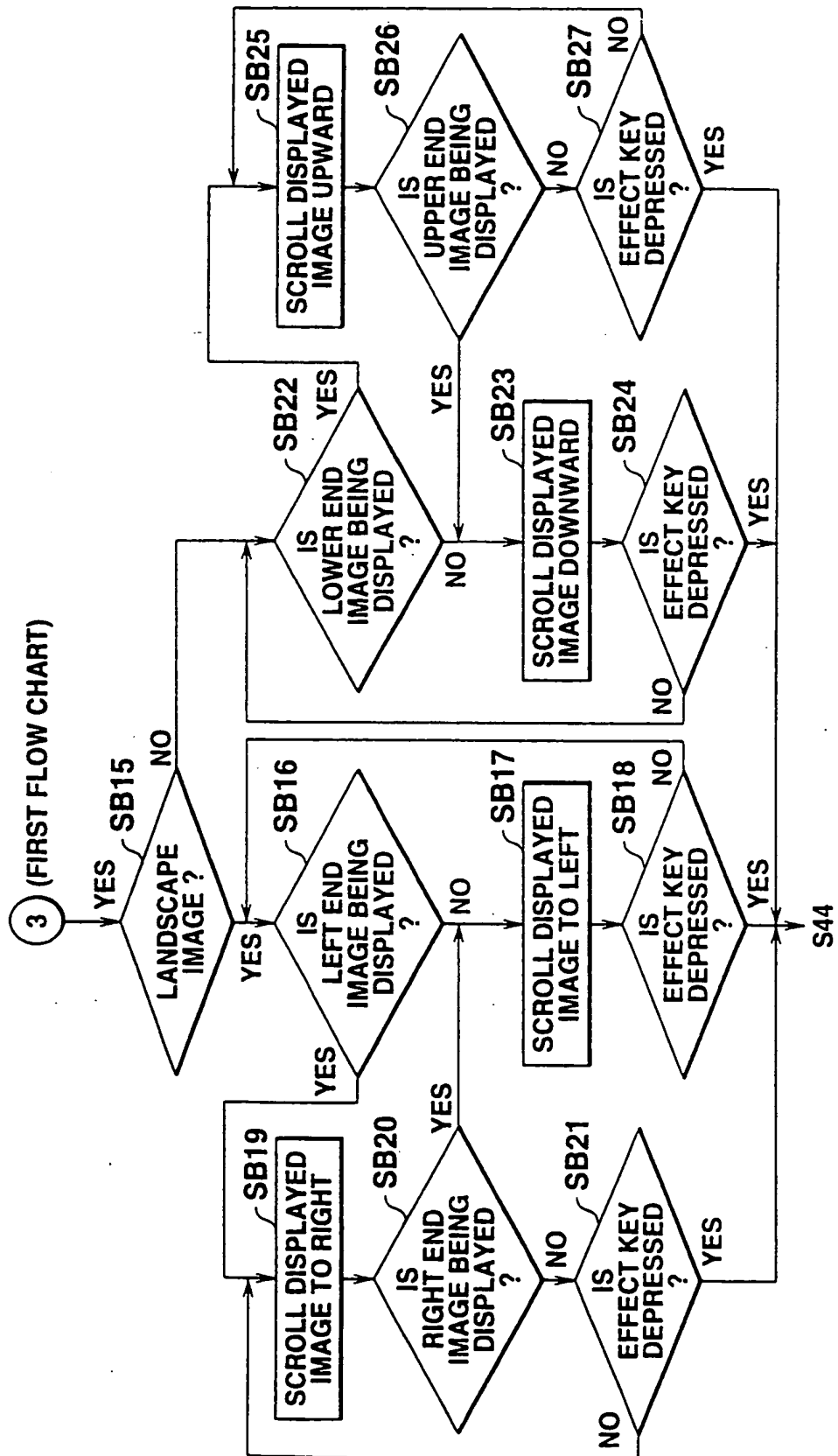


14/22

FIG.15(FIRST FLOW CHART)
(MODIFICATION 1 OF FIG.14)

15/22

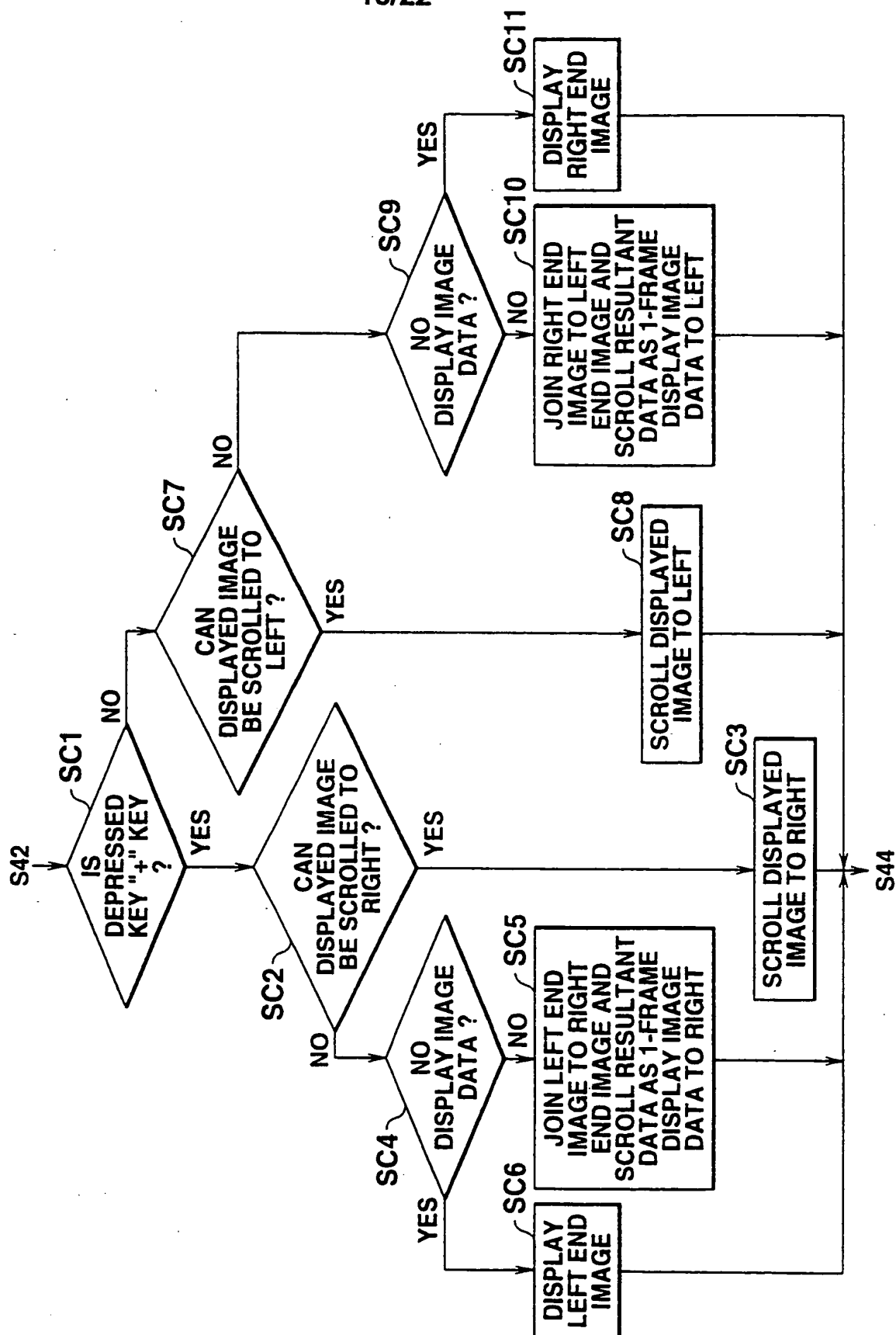
FIG.16
(SECOND FLOW CHART)

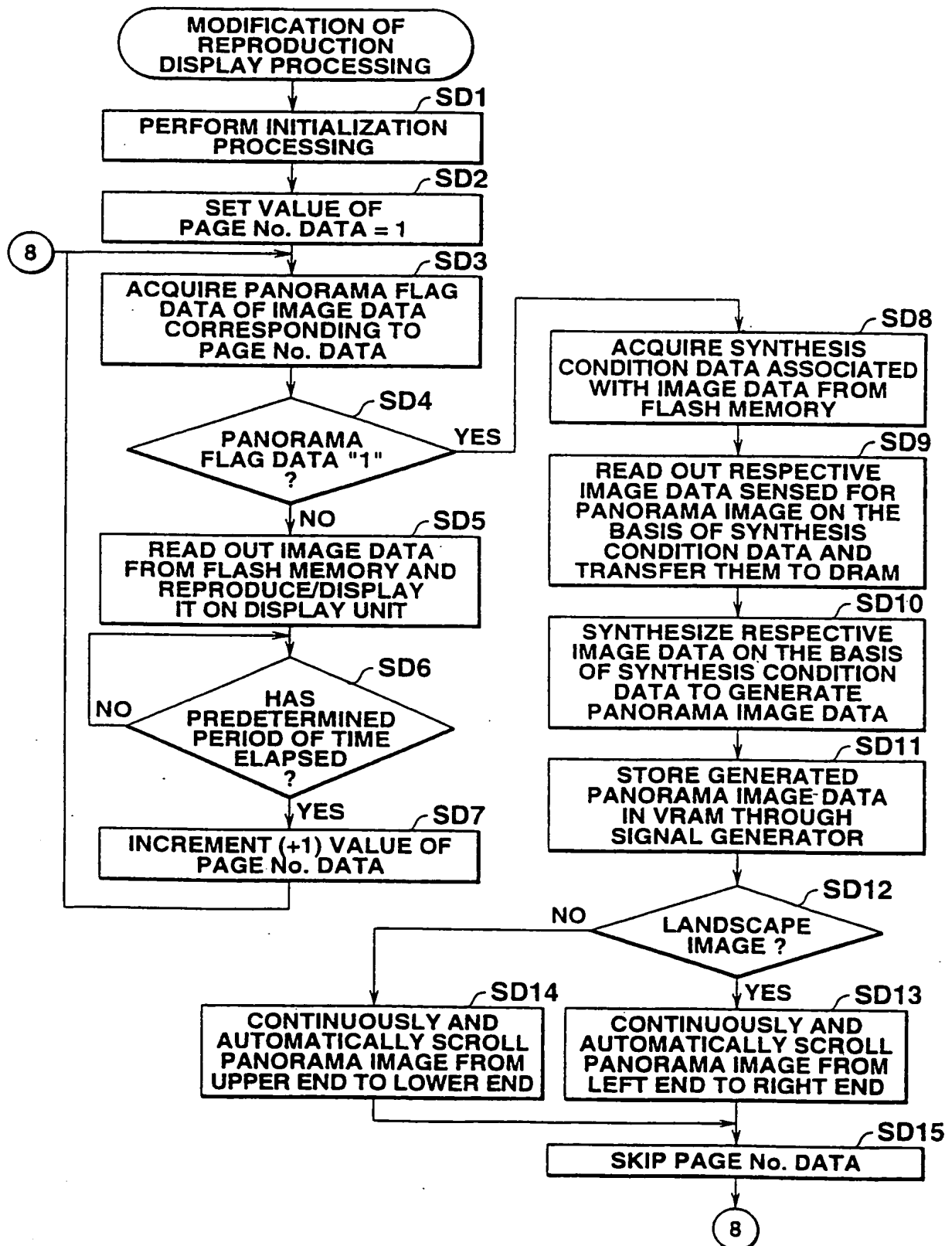


16/22

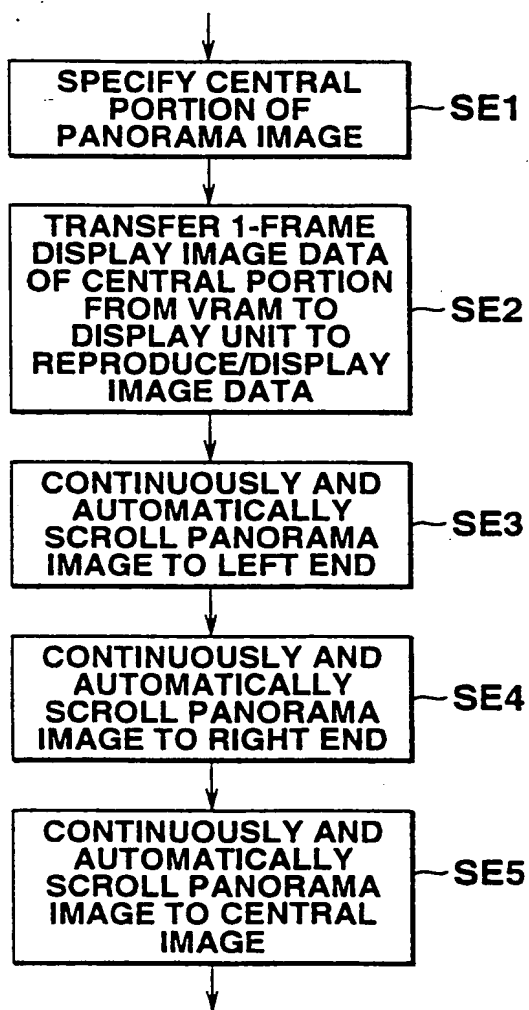
FIG.17

(MODIFICATION 2 OF FIG.14)

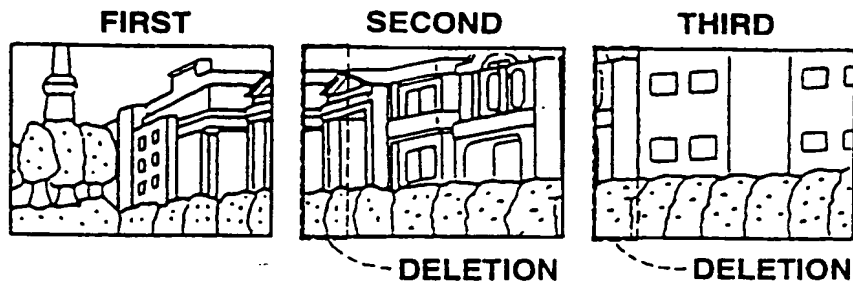


17/22
FIG.18

18/22

FIG.19

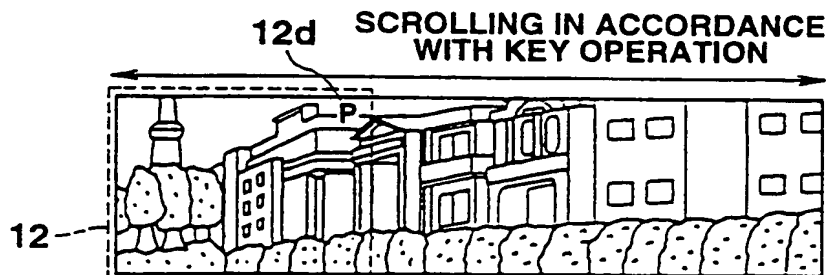
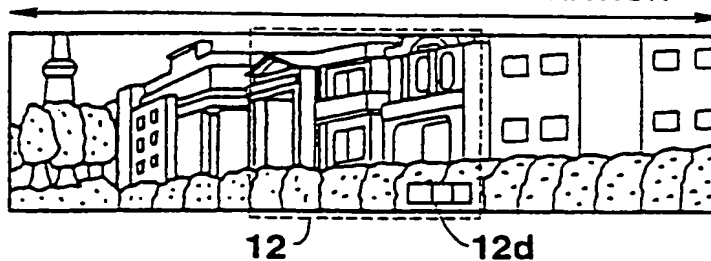
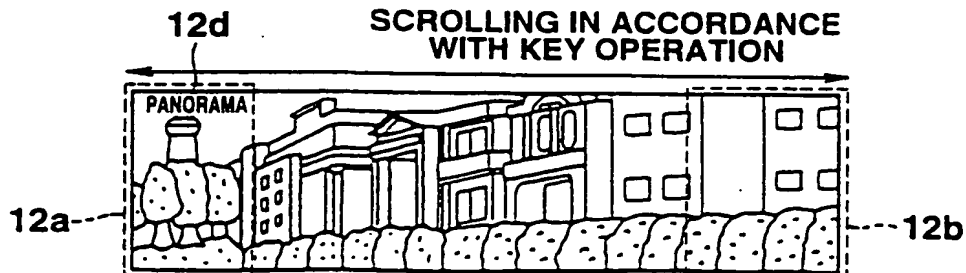
19/22

FIG.20APLURALITY OF IMAGE DATA SENSED IN
PANORAMA PHOTOGRAPHING MODE

SYNTHESIS

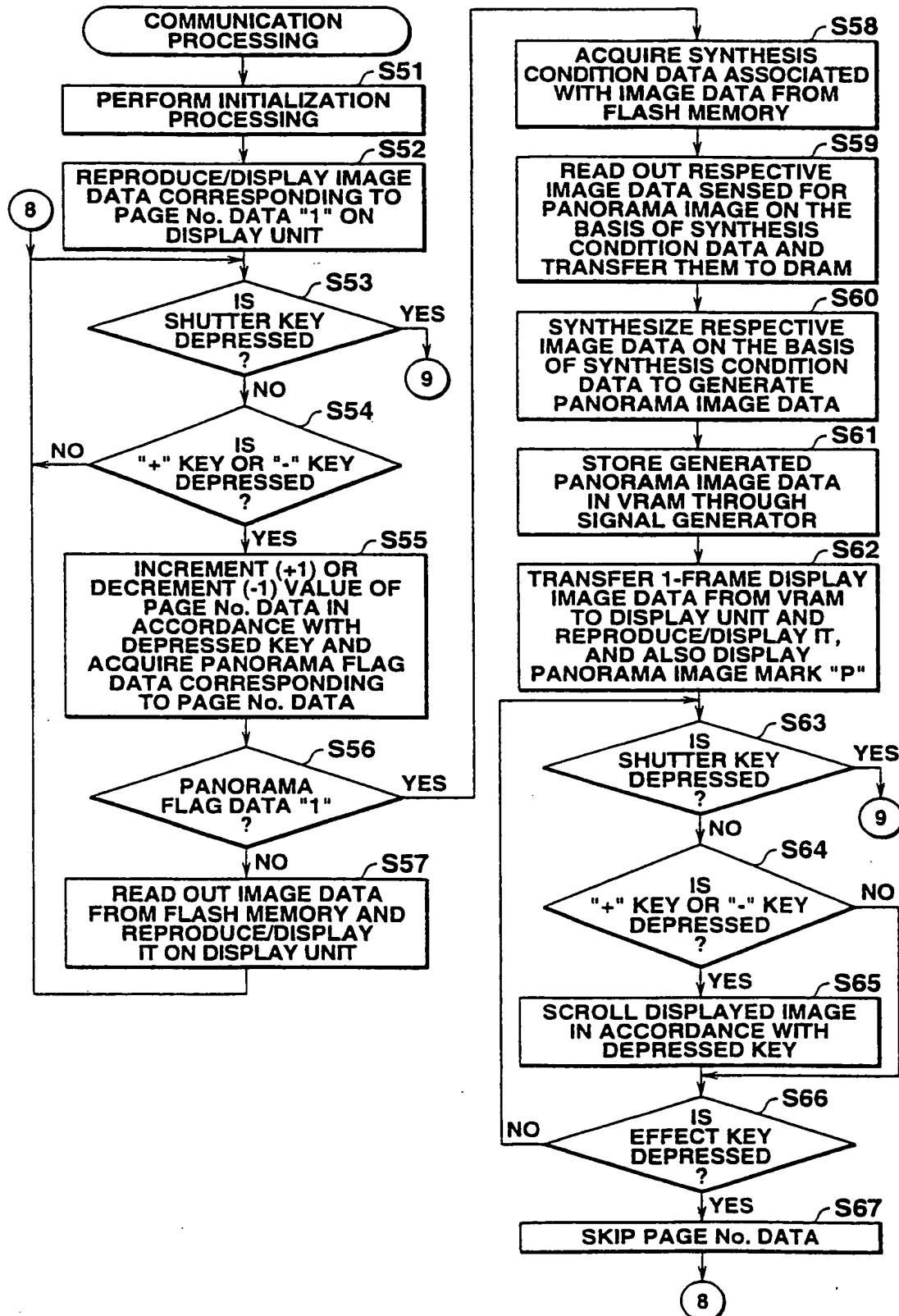
FIG.20B

SYNTHESIZED PANORAMA IMAGE

**FIG.20C**SCROLLING IN ACCORDANCE
WITH KEY OPERATION**FIG.20D**SCROLLING IN ACCORDANCE
WITH KEY OPERATION

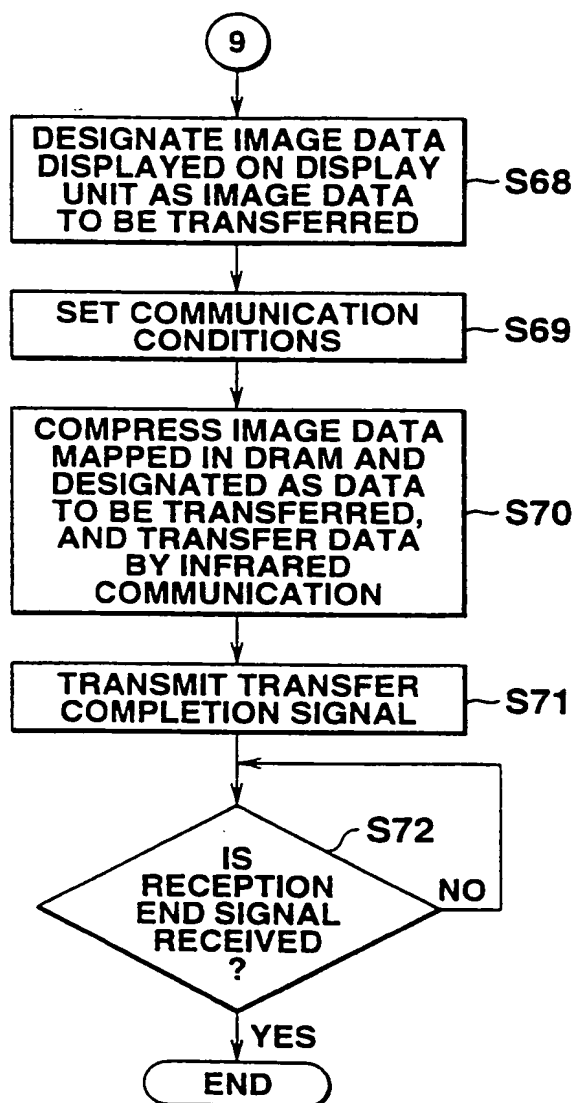
20/22

FIG.21

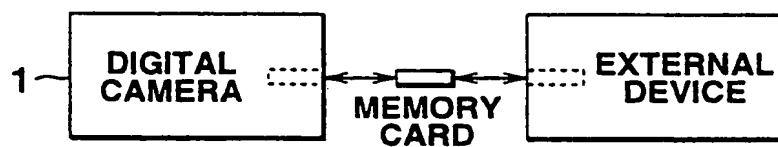


21/22

FIG.22



22/22

FIG.23A**FIG.23B****FIG.23C****FIG.23D**

INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 98/03851

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H04N1/21

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04N G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 762 264 A (SHARP KK) 12 March 1997 see the whole document ---	1-21
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 136 (P-1333), 7 April 1992 & JP 03 296096 A (DAINIPPON PRINTING CO LTD), 26 December 1991 see abstract ---	1-21
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 526 (P-1617), 21 September 1993 & JP 05 142682 A (ASAHI OPTICAL CO LTD), 11 June 1993 see abstract --- -/--	1-21

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

15 October 1998

Date of mailing of the international search report

22/10/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3018

Authorized officer

Greve, M

INTERNATIONAL SEARCH REPORT

Inte. onal Application No
PCT/JP 98/03851

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 095, no. 004, 31 May 1995 & JP 07 007645 A (OLYMPUS OPTICAL CO LTD), 10 January 1995 see abstract ---	1,5-7
A	EP 0 738 075 A (EASTMAN KODAK CO) 16 October 1996 see abstract ---	1,18-20
A	US 5 619 738 A (MANICO JOSEPH A ET AL) 8 April 1997 see abstract ---	1-21
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 098 (P-1494), 26 February 1993 & JP 04 291675 A (FUJITSU LTD), 15 October 1992 see abstract -----	1-21

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 98/03851

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0762264	A	12-03-1997	JP 9069037 A	11-03-1997
			CN 1151556 A	11-06-1997
EP 0738075	A	16-10-1996	JP 8336069 A	17-12-1996
US 5619738	A	08-04-1997	JP 8304911 A	22-11-1996

THIS PAGE BLANK (USPTO)

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.

THIS PAGE BLANK (USPTO)